Brucellosis:

An Update

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BRUCELLOSIS: AN UPDATE

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BRUCELLOSIS, or contagious abortion, in cattle remains one of the most widespread and economically ravaging diseases throughout the world. The disease, caused by the bacterium *Brucella abortus*, affects primarily cattle; however, a number of other animal species are affected. Although man is an aberrant host, human infections are not uncommon.

In cattle, *B. abortus* is readily transmitted between infected and noninfected cattle by ingestion. The sources are aborted fetuses, placental tissues, or discharges from an infected cow. Other possible methods of transmission include inhalation, direct contact, via milk, and the gravid uterus at birth. Although there are four recognized biotypes of *B. abortus*, approximately 85 percent of all reported infections in cattle are caused by biotype 1.

HISTORY OF THE DISEASE

Human brucellosis, or "undulant fever," was recognized as a zoonosis in 1905. The disease is acquired by man from infected animals. Although human infections due to *B. abortus* (from cattle) and *B. suis* (from swine) are more prevalent, such animals as goats (*Brucella melitensis*), and even in rare cases dogs, (*Brucella canis*) could transmit the infection to man. The risk of humans contacting brucellosis is closely linked to their exposure to infected livestock, methods of husbandry, and food habits.

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In humans, the disease is self-limiting in that transmission from person to person is rare. The organisms (*B. abortus*) are borne by unpasteurized milk and other dairy products, such as cheese, butter, and ice cream, that are prepared from contaminated milk. The disease constitutes an occupational hazard, particularly for farmers, veterinarians, slaughtering and rendering plant workers, and others engaged in handling infected livestock or contaminated byproducts. The human disease is characterized by a fluctuating temperature (undulant fever), fatigue, night-sweats, lethargy, and muscular pain. Due to its insidious nature, the disease is often misdiagnosed and leads to prolonged periods of illness and inactivity.

The onset of symptoms in 104 cases of human brucellosis reported to the Center for Disease Control in 1977 was acute in 55 percent and insidious in 45 percent. A timely and accurate diagnosis, however, could lead to a cure when infected individuals are promptly treated with antibiotics such as the tetracyclines, rifampin, and the quinolones. Recent trends in the epidemiology of brucellosis indicate that a progressive decrease in the incidence of brucellosis in livestock is paralleled by a corresponding reduction of the disease in humans, table 1.

TABLE 1. INCIDENCE OF HUMAN BRUCELLOSIS REPORTED TO THE CENTERS FOR DISEASE CONTROL

Item	Reported, by year .									
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Reported cases	179	215	183	185	173	200	131	153	106	129
Cases per 100,000 population	0.08	0.10	0.08	0.08	0.07	0.09	0.06	0.06	0.04	0.05
Number of deaths	3	2	-	1	2	-	-	1	-	

ERADICATION PROGRAM

In 1934, the Federal State Cooperative Brucellosis Eradication Program was established with the passage of the Jones-Connally bill. However, it was not until after 1945 that a concerted effort with adequate funds and manpower became available to implement fully the national program under the direction of the Animal and Plant Health Inspection Service (APHIS), then Bureau of Animal Industry, of the U.S. Department of Agriculture (USDA). To make the program workable, guidelines with

accepted methods and rules were established and periodically evaluated. In 1947, the established guidelines were adopted as Uniform Standards of Methods and Rules. Currently, established "Uniform Methods and Rules" set forth minimum standards for states to achieve brucellosis eradication. These include minimum standards for certifying and validating herds, classifying and validating states, and detection, quarantine, and elimination of infected animals, as well as regulations for the intrastate and interstate movement of cattle and swine. The greatest progress towards eradication dates from 1954 when Congress appropriated additional funds for an accelerated program.

As a result of the resurgence of bovine brucellosis and a corresponding increase in the number of human infections, a National Brucellosis Technical Commission was appointed in March 1976 by the joint USDA-APHIS and the Brucellosis Committee of the U.S. Animal Health Association to evaluate the Cooperative Federal State Brucellosis Eradication Program. The commission identified the constraints for successful implementation and recommended changes in the program in its report of August 1978. The findings of the commission, together with the independent study conducted by the National Academy of Science in 1976, augmented the demand for additional Congressional appropriations for research on brucellosis in the context of the eradication program.

In October 1985, a 5-year brucellosis eradication plan was initiated with the purpose of reducing federal involvement and increasing state and industry participation in the brucellosis eradication efforts. After September 1990, Federal participation will be limited to those activities which by law or scope are limited to surveillance, monitoring, and compliance. Today, all states within the United States and the protectorates Puerto Rico and the Virgin Islands participate in the brucellosis eradication program. Auburn University has been involved in the eradication program, with research conducted to identify infected herds and to monitor progress towards eradication.

Under uniform methods and rules (UMR), states or areas are classified according to the herd incidence of brucellosis into four classes: A, B, C, and "class free." Among others, two of the criteria for a state or an area within a state to meet the classification standards for "class A" are that (1) it should have an infection rate for cattle herds less than 0.25 percent during the previous 12 months, and (2) the adjusted market cattle identification (MCI) reactor prevalence rate for the previous 12 months must be less than 0.1 percent. For "class B" status, the infection rate for cattle herds must not exceed 1.5 percent during the previous 12 months and the adjusted MCI reactor prevalence rate cannot exceed 0.3 percent during the previous 12 months. To qualify for "class C" status, the infection rate for cattle herds during the previous 12 months would have exceeded 1.5

percent and the adjusted MCI reactor prevalence rate for the previous 12 months would have exceeded 0.3 percent. Included among the requirements for "class free" status are that the cattle herds in the state or area within a state must remain free from brucellosis for 12 months or longer and the adjusted MCI reactor prevalence rate for the previous 12 months must not exceed 0.05 percent.

RESULTS OF PROGRAM

National Results

In November 1988, Washington, Arizona, and Virginia attained brucellosis "class free" status, bringing the total number of "class free" states to 27 during the fiscal year (FY) 1988, figure 1. Sixteen states remain in "class A," and 6 states fall within the "class B" classification. Florida has a split "class B/C" status. While the Virgin Islands continues to hold a "class free" status, Puerto Rico, which was classified "class free" since 1985, slipped back to "class A" due to the detection of three infected herds during FY 1988, figure 1.

The total number of cattle tested for brucellosis in FY 1988 was 16.1 million, down 0.7 million from FY 1987. There were 3,514 reactor herds detected in FY 1988, 25 percent less than the 4,702 detected the previous fiscal year. Of the nation's total population of dairy cows, 60.2 percent are in "class free" areas, 29.4 percent are in "class A" areas, 8.9 percent are in "class B," and 1.5 percent in "class C" areas. Considering both beef and dairy cattle together as the United States total cow herds, 30.2 percent are located in "class free" areas, 40.8 percent in "class A" areas, 26.4 percent in "class B," and 2.6 percent in "class C" areas. During FY 1988, there were 25,361 MCI reactors in the United States, of 11,863,978 tests performed. The national gross MCI reactor rate was 0.214 percent (the national gross MCI reactor rate is calculated by dividing the total number of reactors by the total number of MCI tests). Of the nation's total reactor herds, 83 percent are located in 6 states and 17 percent in the remaining 44 states.

Alabama Results

In September 1987, the USDA, APHIS, upgraded Alabama from "class B" to "class A." The total cattle population in Alabama is 1,800,000 (includes beef and dairy cattle and calves). Of this number, approximately 42,000 herds are comprised of beef cattle with 901,000 brood cows. There are approximately 350 dairy herds with a total of approxi-

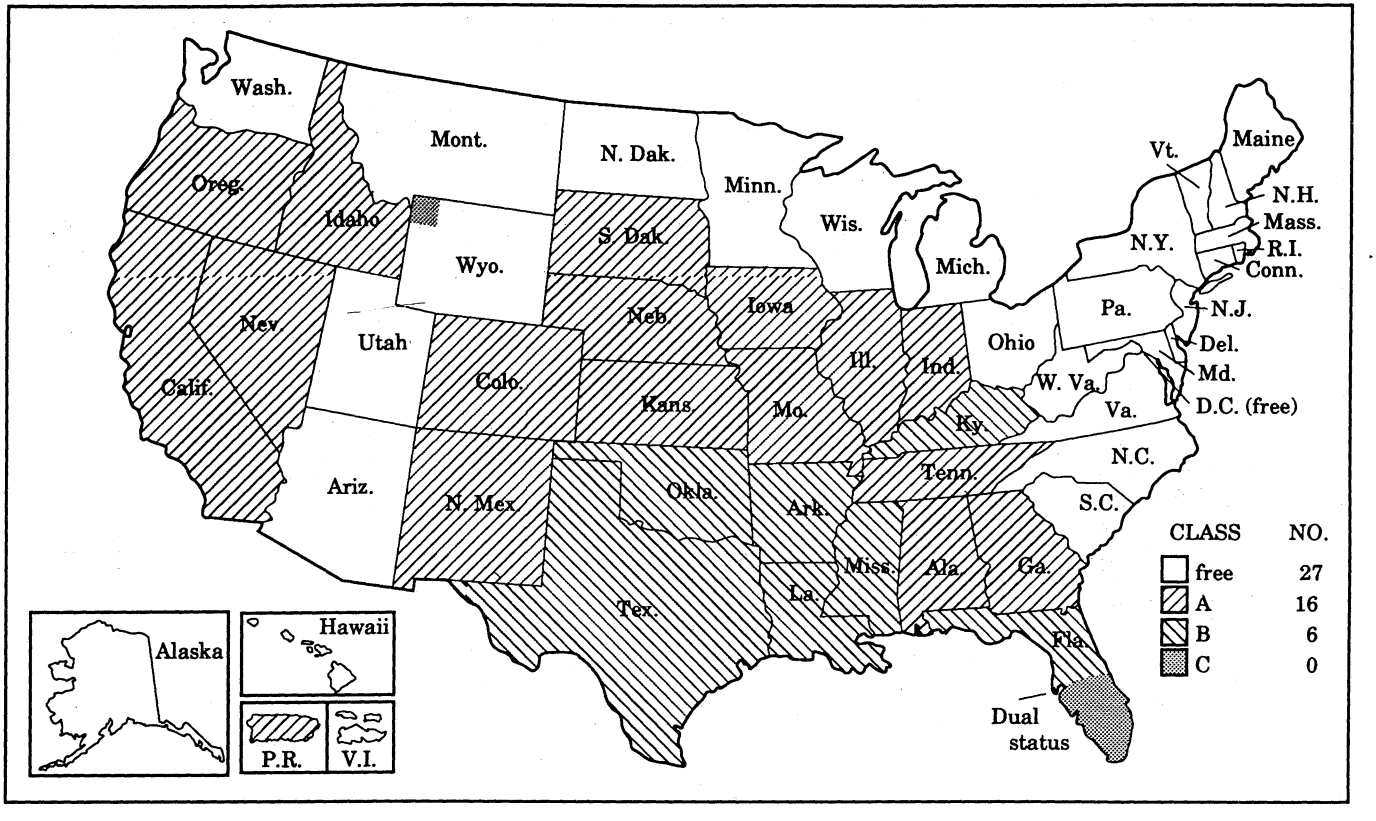


FIG. 1. Cattle brucellosis state classification, September, 1988.

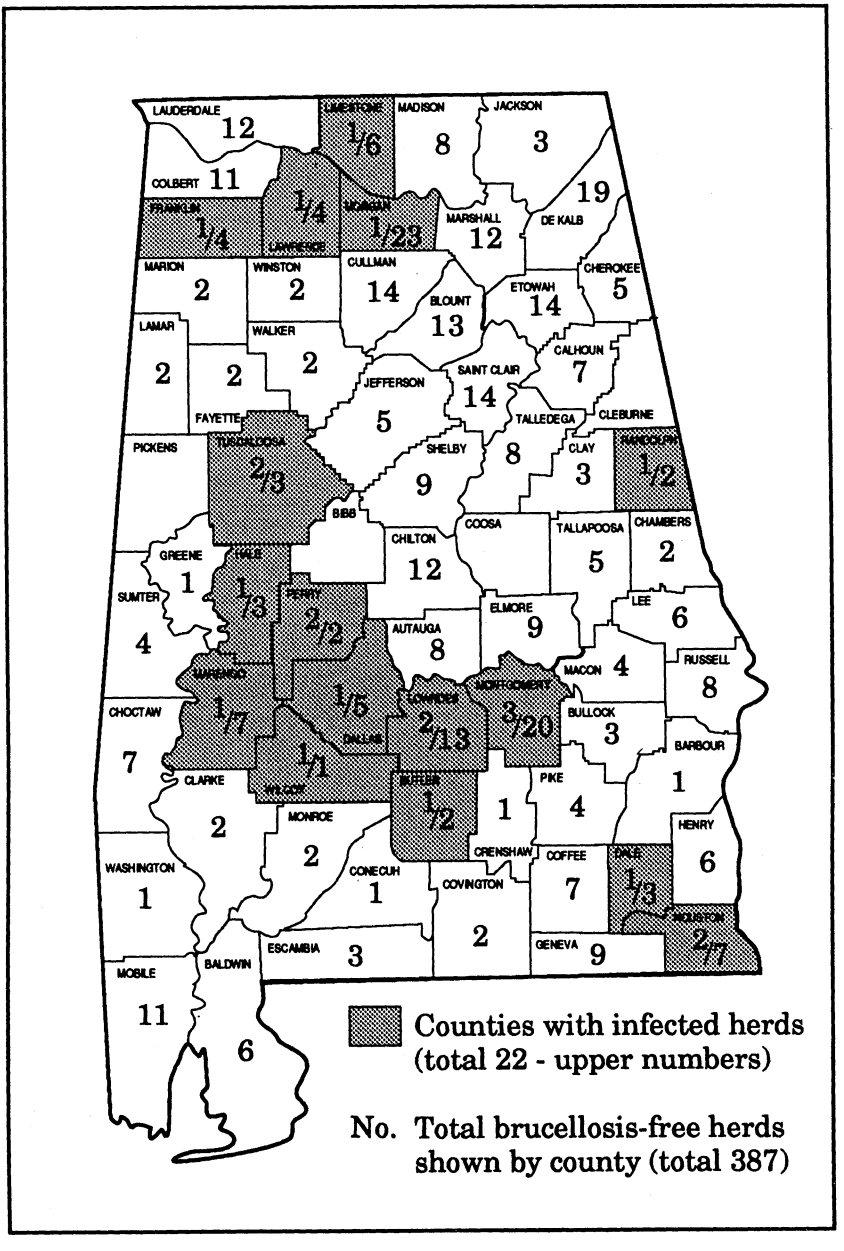


FIG. 2. Brucellosis infection status as of November 30, 1988.

TABLE 2. BRUCELLOSIS SURVEILLANCE AND INFECTED HERDS IN ALABAMA

Year	MCI cattle tested	On farms tests		Infected herds Dec. 31 each year
		Herds	Cattle	
	No.	*No.*	*No.*	*No.*
1985	252,174	4,207	114,492	79
1986	268,345	3,771	95,989	57
1987	267,227	3,244	79,326	37
1988	210,338	2,738	67,463	25

mately 40,000 dairy cows. As of November 1988, 22 brucellosis-infected herds were identified within the State and 397 herds were certified as brucellosis-free, figure 2. A majority of Alabama's infected herds were located in the northern and central counties where intensive cattle farming is practiced.

The substantial decline in the number of infected herds, table 2, since 1985 is a clear indication of the progress being made towards the final goal of eradicating brucellosis from the State. Adult vaccination, increased emphasis on epidemiological, trace-back, and first-point testing for brucellosis have immensely contributed to the sharp decline in herd infections within Alabama. Successful implementation of the eradication procedures are to an appreciable measure credited to the cooperation of many Alabama herd owners and the efforts made by them to maintain healthy herds free from brucellosis by vigilant and careful management.

As the brucellosis eradication program advances, it becomes increasingly evident that the final elimination of brucellosis will require extensive use of surveillance testing procedures and the adoption of effective statewide depopulation and judicious vaccination programs. Beyond intelligent application of existing efficient control programs, recent developments in brucellosis research may help devise better diagnostic and immunization procedures. A new brucellosis vaccine based on genetically altered *Brucella abortus* bacterium developed by scientists at the Texas A&M University is presently being evaluated by the USDA.

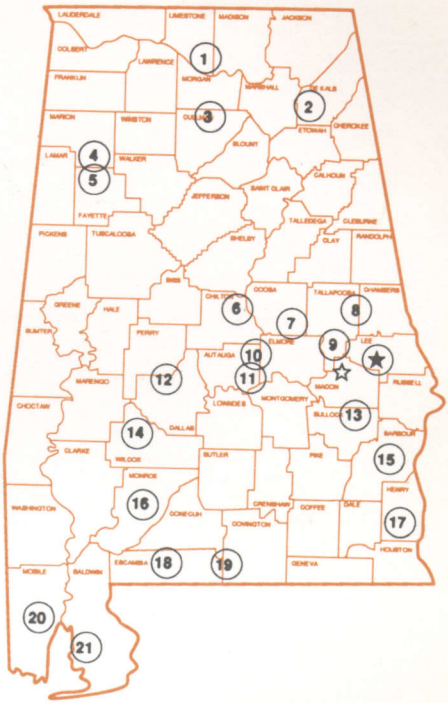
CONCLUSIONS

Acceleration of the eradication program requires that primary surveillance be supported by improved epidemiological investigations of all infected herds. Towards this end, a network of microcomputer-based brucellosis information systems is presently being installed nationwide.

Considering the overall progress that has been made, there is growing optimism that total eradication of brucellosis from the United States is a realistic goal, but the task that lies ahead to realize this objective could not be considered as trivial.

Alabama's Agricultural Experiment Station System
AUBURN UNIVERSITY

With an agricultural research unit in every major soil area, Auburn University serves the needs of field crop, livestock, forestry, and horticultural producers in each region in Alabama. Every citizen of the State has a stake in this research program, since any advantage from new and more economical ways of producing and handling farm products directly benefits the consuming public.



Research Unit Identification

★ **Main Agricultural Experiment Station, Auburn.**
☆ **E. V. Smith Research Center, Shorter.**

1. Tennessee Valley Substation, Belle Mina.
2. Sand Mountain Substation, Crossville.
3. North Alabama Horticulture Substation, Cullman.
4. Upper Coastal Plain Substation, Winfield.
5. Forestry Unit, Fayette County.
6. Chilton Area Horticulture Substation, Clanton.
7. Forestry Unit, Coosa County.
8. Piedmont Substation, Camp Hill.
9. Plant Breeding Unit, Tallassee.
10. Forestry Unit, Autauga County.
11. Prattville Experiment Field, Prattville.
12. Black Belt Substation, Marion Junction.
13. The Turnipseed-Ikenberry Place, Union Springs.
14. Lower Coastal Plain Substation, Camden.
15. Forestry Unit, Barbour County.
16. Monroeville Experiment Field, Monroeville.
17. Wiregrass Substation, Headland.
18. Brewton Experiment Field, Brewton.
19. Solon Dixon Forestry Education Center, Covington and Escambia counties.
20. Ornamental Horticulture Substation, Spring Hill
21. Gulf Coast Substation, Fairhope.