

# Current Status of Adult Cattle Vaccination with Strain 19 in Florida

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The use of a reduced dose of Strain 19 in adult cattle was approved following initial studies in Florida (1). This procedure is necessary in many large herds since test and slaughter methods alone fail to eliminate brucellosis.

In April, 1977, several large dairy and beef herds initiated adult cattle vaccination. Over 100 herds have been vaccinated (Table 1) and the number is increasing.

The cattle in infected herds are tested, card test reactors slaughtered, and remaining cattle inoculated subcutaneously with approximately 3 billion ( $3 \times 10^9$ ) Strain 19 cells (1/25th standard dose). The herds are retested within 6 months and thereafter at approximate 3 month intervals. The blood samples are screened with buffered plate antigen (dairy herds) or the card test (beef herds). Serums positive to buffered plate antigen are retested with the card test. All card test positive samples are retested using the rivanol (Riv) test in dairy herds and both rivanol and complement fixation (CF) tests in beef herds. Dairy cattle whose serum is positive on the Riv test are retested and card, Riv, and CF tests performed on all serums along with bacteriologic studies on milk samples collected from selected cattle. The Riv test is considered positive in the 1:25 dilution but cattle are not usually considered infected without supporting positive CF test titers in the 1:40 dilution or higher.

A history of 81 herds vaccinated with Strain 19 is given in Table 2. The dairy herds had been tested at approximate monthly intervals. As evidence of the increasing incidence of brucellosis, 25% of the card test reactors for 1 year were removed at time of vaccination. In the beef herds this was 42% but these herds had not been tested as frequently as the dairy herds.

A comparison of the percentages of cattle which were positive on card, Riv, and CF tests on 3 herd retests is shown in Table 3. Since many cattle were in the incubative stage of the disease when inoculated, many infected cattle were detected on the first post-vaccinal test. By the third herd retest the number of probable infected cattle was reduced by 85% in the dairy herds and 90% in the beef herds.

Cultural studies were performed on milk to evaluate results of serologic tests and determine the percentage of field strains and Strain 19 (Table 4). Approximately 10% of the isolates were Strain 19.

Nearly all of these are identified on the first post-vaccinal test. Most of these Strain 19 shedders were permitted to remain in the herd and few were positive on subsequent attempts. Earlier studies by this author have confirmed that Strain 19 shedders are positive to Riv and/or CF tests. Therefore, when serologic and bacteriologic results are compared, the percentage of Strain 19 shedders is less than 1% of the total vaccinated population and the udder infection is usually of short duration.

### Conclusions

The use of Strain 19 in adult cattle to produce rapid herd resistance is necessary in many large herds to control brucellosis. A reduced (1/25th standard) dose has proven to be very effective in lessening the number of cattle removed from the herds (85 to 90% in 1 year) and in minimizing the effects of false positive reactions on serologic procedures. The complement fixation test is superior to others in correctly diagnosing infection in vaccinated cattle.

Adult cattle vaccination should be combined with identification and removal of infected cattle and proper herd management. These require the efforts of herd health veterinarians, trained specialists, and adequate laboratory facilities and personnel. The practicing veterinarian should become a more active member of this team.

### Reference

- Nicoletti, Paul: A Preliminary Report on the Efficacy of Adult Cattle Vaccination Using Strain 19 in Selected Dairy Herds in Florida. Proc. 80th Ann. Meet., U. S. Animal Health Association, 1976, 91-106.

Table 1  
 Status of 110 Herds Vaccinated with Strain 19.

Type of Herd	Number Vaccinated	Number Cattle	Average	Card Test Reactors*	Percent of Herd
Dairy	85	54,393	640	1983	3.6
Beef	25	36,862	1474	2425	6.6

\*At time of vaccination

Table 2  
 History of 81 Herds Vaccinated with Strain 19.

Type of Herd	Number	No. Cattle	Average	Card Test Reactors		%
				Previous Year	At Time of Vaccination	
Dairy	63	46,029	731	6042	1504	25
Beef	18	32,465	1803	4335	1817	42

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Table 3

Results of Herd Retests using Card, Rivanol (Riv) and Complement Fixation (CF) Tests after Adult Vaccination.

	Herds	Cattle	Percent Positive		
			Card	Riv	CF
First Retest					
Dairy	56	31,476	13.0	6.1	4.5
Beef	14	19,120	6.2	4.6	1.9
Second Retest					
Dairy	39	23,439	11.3	2.6	1.5
Beef	8	7,982	5.0	1.8	.6
Third Retest					
Dairy	14	9,770	8.5	1.5	.7
Beef	2	1,871	2.6	.5	.2

Table 4

Comparison of 3 Serologic Tests with Cultural Studies on Milk of Cattle Vaccinated 3 to 5 Months Previously with Strain 19.

Test	Result	Number Cultured	Number Positive (%)	Strain 19 (%)
Card	P	403	177 (44)	19
	N	12	0	0
Rivanol	P	373	177 (47.5)	19
	N	42	0	0
Complement Fixation	P	310	175 (56.5)	18
	N	105	2 ( 1.8)	1
Total		415	177 (42.6)	19 (10.7)

## APHIS: Researchers Aid Cattle Industry in Brucellosis Eradication Effort

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The battle against brucellosis takes place not only at the cattle ranch and farm but also in the laboratory. Supporting and supplying producers, veterinarians and health officials with an arsenal to fight the disease, researchers across the country strive for more efficient eradication methods.

Brucellosis research has progressed rapidly since Sir David Bruce, for whom the disease was named, studied the organism 91 years ago. Although many discoveries have been made in the areas of disease characteristics, transmission, detection, control and prevention, brucellosis (Bang's disease) lingers on.

The U.S. Department of Agriculture (USDA) has functioned as a major sponsor of brucellosis study since the early part of this century, according to Dr. Edward Schilf, assistant to the deputy administrator of the USDA's Animal and Plant Health Inspection Service (APHIS). Years of research have spawned tests and Strain 19 vaccine in use today, but dedicated individuals continue to hunt for a greater understanding of the disease.

"USDA's Science and Education Administration-Federal Research (formerly the Agricultural Research Service) has placed great emphasis on brucellosis research over the years," said Dr. Edwin R. Goode, Jr., staff scientist with the livestock and veterinary science staff. He added that socioeconomic reasons, such as greater demand by cattle producers and availability of federal funds, have contributed to the expansion of this research.

Research efforts in brucellosis diminished during the late 1950's and 1960's as eradication goals moved closer to reality and scientists delved into more immediate concerns such as cancer research, according to Dr. Winthrop C. Ray, epidemiologist with APHIS's cattle disease staff. When the research arm of USDA cut funding, APHIS sponsored additional field investigations. However, the new thrust in research resulted as these efforts proved inadequate.

### Government Reacts to Constructive Criticism

Interest on the part of cattlemen's associations and persistence on the part of Dr. Paul Nicoletti, an APHIS veterinary epidemiologist who has spent most of his 23 years of government service on brucellosis programs, spurred a re-evaluation of the need for flexibility in the traditional program. His major concern was to find a practical solution to heavily infected herds in high-incidence states. He stressed the importance of wider application of vaccines in a manner which would minimize loss to owners and spread of disease.

### Revival of Research

On the upswing since the early 1970's, the incidence of brucellosis peaked in 1975. In response to this increase and concurrent resurgence of human brucellosis, interest in research has been revived over the past two years. Producers' cooperation in accelerated test and slaughter efforts and more emphasis advocating calfhood vaccination programs has resulted in a reversal of the upward trend in infection rates. This year, SEA and APHIS have channeled about \$2 million into 20 research projects, while

jointly considering several new proposals. Brucellosis research, veterinary officials agree, has regained stature as a challenging and imperative field.

"Research seeks to expand knowledge of the disease. This in turn can facilitate the development of less expensive eradication procedures, more accurate tests and increased vaccine efficiency," explained Dr. Ray. Dr. Goode further described research aims as "pragmatic and balanced." The diverse programs encompass realistic and far-reaching goals, while not prophesizing miracle cures. More specifically, the two focal points of exploration involve diagnostic tools and improved vaccines.

### Diagnostic Tools

One promising project for improving diagnostic methods centers on the enzyme-labeled antibody test (ELA) being studied at the Los Alamos Scientific Laboratory in New Mexico. Dr. Ray called ELA a potentially sensitive yet specific testing procedure capable of differentiating between vaccine-induced antibodies and antibodies present in response to brucellosis infection. Antibodies are produced within the body when foreign materials (antigens) such as bacteria are introduced to help inactivate and destroy the agent. ELA could be instrumental in detecting the disease prior to abortion and mass exposure.

### Immunity and Improved Vaccines

Dr. Ray described two types of immunity to infection: humoral, in which protection is provided by antibodies in the blood, and cell-mediated immunity, which may comprise 95 percent of an animal's resistance potential to brucellosis. "The key to this resistance lies in cell activity rather than the antibody," he said. Scientists theorize that lymphocytes, which compose one class of cell elements, can be sensitized to a particular antigen. When later exposed to that antigen, the lymphocytes will activate other cells to destroy the virulent organism. An investigation to detect the presence of sensitized lymphocytes in blood samples is being carried out at the University of Minnesota, which is hoped will lead to better diagnostic methods.

Scientists are also investigating the transfer of sensitized T-lymphocytes from a resistant animal to a susceptible one. Dr. Goode feels that if successful, this immunization procedure could replace the live brucellosis vaccine. The transfer of lymphocytes would eliminate the need for a vaccine and the subsequent risk of diagnostic interference due to antibodies directed toward the infected brucella cells. The principle of transferring immunity could have broad application in the prevention of human and animal disease.

Another related endeavor involves the fractionation of cells in search of tiny components which could effectively spur an immune response. These "lymphokines" have various functions which may suppress or enhance a particular reaction. Observing two-and-a-half years of work in this field at the National Animal Disease

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