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THE BRUCELLOSIS ERADICATION
PROGRAM IN TEXAS

by

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BIOMEDICAL SCIENCE CORPS

THESIS

Presented to the Faculty of The University of Texas

Health Science Center at Houston

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in Partial Fulfillment

of the Requirements

for the Degree of

MASTER OF PUBLIC HEALTH

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DEDICATION

This thesis is dedicated to all the members of my family. They have been a source of inspiration, support, and example that has influenced my life and molded the values by which I live.

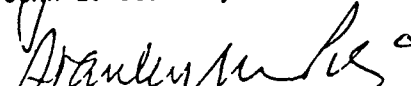
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Above all, credit for completing this project goes to my loving wife, Roberta. It was her patience, understanding, and support that made this thesis a reality. I also thank my daughters Kasey, Jenny, and Abby for their help and understanding.

September, 1983

THE BRUCELLOSIS ERADICATION
PROGRAM IN TEXAS

Erwin D. Jemelka, DVM, MPH
The University of Texas, 1983

Supervising Professor: John E. Scanlon, Ph.D.

The Texas Brucellosis Eradication Program was revised in 1980 to comply with the federal Uniform Methods and Rules (UMR). The United States Department of Agriculture, Animal Plant Health Inspection Service (USDA, APHIS) developed the UMR to fulfill the desires of the U.S. Animal Health Association which is comprised of veterinarians, livestock industry members, and special interest groups. The Texas Animal Health Commission (TAHC) is responsible for implementing the eradication program objectives in Texas. The previous Texas Brucellosis Program was in effect for over 20 years but brucellosis was not eradicated, and the program resulted in skepticism, controversy, and revolt among livestock owners.

A study of the revised Texas Brucellosis Eradication Program was performed. A questionnaire was submitted to owners of infected herds and organization members affected by brucellosis were interviewed. They are the cattle industry, regulatory officials and practicing and research veterinarians. The study results will assist the TAHC to determine if the new program objectives are being accomplished and if the support and confidence of the Texas livestock industry is being regenerated.

TABLE OF CONTENTS

	<u>Page</u>
DEDICATION	ii
ACKNOWLEDGEMENTS	iv
ABSTRACT	v
LIST OF TABLES	viii
LIST OF FIGURES.	ix
 CHAPTER	
I. INTRODUCTION	1
DEFINITION OF TERMS AND ANCRONYMS.	4
II. COMMUNITY HEALTH PROBLEM	5
III. THE NATURE AND DISTRIBUTION OF THE BRUCELLOSIS PROBLEM	9
IV. TEXAS BRUCELLOSIS PROGRAM AUTHORITY.	13
V. TEXAS BRUCELLOSIS PROGRAM GOALS, COSTS AND BENEFITS.	16
A. TAHC GOALS AND PROGRAM OBJECTIVES.	16
1. CALFHOOD VACCINATION	16
2. LABORATORY SYSTEM.	17
3. SURVEILLANCE PROGRAM	19
4. EPIDEMIOLOGICAL AND HERD HEALTH SURVEYS.	21
5. ACCELERATED ERADICATION PROGRAM.	22
B. COST AND BENEFIT ANALYSIS.	22
VI. RESEARCH AND PROJECT DESCRIPTION	25
A. INTERVIEWS	25
B. QUESTIONNAIRE.	26
VII. AGENCY INTERVIEWS.	29
A. AGENCY REPRESENTATIVES	29
B. INTERVIEWS	30

VIII. SURVEY DISCUSSION	53
IX. SUMMARY AND CONCLUSION.	72
APPENDIXES	
A. INTERVIEW PACKET.	79
B. QUESTIONNAIRE PACKET.	84
C. SURVEY RESULTS (1982)	89
D. SURVEY RESULTS (1977)	116
BIBLIOGRAPHY.	122
VITA.	124

LIST OF TABLES

Table 1	Human Brucellosis by County of Residence and Source of Exposure	8
Table 2	Brucellosis Vaccination Statistics	17
Table 3	Laboratory Analyses.	19
Table 4	Brucellosis Surveillance Statistics.	21
Table 5	Number of Epidemiologic Investigations	21
Table 6	Number of Herd Plans Developed	21
Table 7	Projected Economic Change For Brucellosis Eradication Program.	24
Table 8	Cost-Benefit Analysis for Brucellosis Eradication Program.	24

LIST OF FIGURES

Figure 1	Distribution of Human Brucellosis in Texas	74
Figure 2	Distribution of Brucellosis Bovine Infected Herds in Texas . .	75
Figure 3	Comparison of Infected Herds-Initial Testing vs FY '82	76
Figure 4	Accelerated Program Areas.	77
Figure 5	Accumulative Calfhood Vaccinations FY '80, '81, '82.	78

CHAPTER I

INTRODUCTION

The brucellosis eradication program affects human health as well as the livestock industry in Texas. The problem stems from the fact that humans acquire the disease from infected animals or animal by-products, such as milk, cheese and other dairy products. Texas initiated a brucellosis eradication program in 1959, but the problem has persisted and is very controversial among livestock producers, politicians, regulatory officials, and veterinarians.

Initially the program consisted of calfhood vaccination with Strain 19 Brucella abortus vaccine and test and slaughter of infected herds and sale barn cattle returning to the farm. Later the Market Cattle Identification (MCI) program was initiated to trace back infected herds through cattle sold and slaughtered at abattoirs.

At the onset of the eradication program in Texas, livestock producers vaccinated their calves and reached a 20 percent vaccination rate in the early 1960's. But the Strain 19 vaccine resulted in many cattle becoming reactors to the standard serum agglutination test used for detecting reactors. As a result the livestock industry and regulatory officials became skeptical of the vaccine, and its use was not encouraged. The vaccination rate in the early 1970's dropped to approximately five percent.

The test and slaughter program has been the mainstay of the Texas brucellosis eradication program as well as the national brucellosis eradication program. Coupled with the MCI program, it was the primary means of controlling and eradicating brucellosis. But the test and slaughter program failed to control, much less eradicate, brucellosis. In fact, a nationwide increase in brucellosis was noted. In 1974, Teague (1978) indicated there

were 16,401 infected herds in the United States. The cattle producers revolted at the costly, restrictive, and ineffective program in 1975. The National Brucellosis Technical Commission (NBTC) was then formed to study the disease and determine if brucellosis eradication was biologically and economically feasible. The Commission report indicated the disease could be eradicated.

Numerous articles, research projects, and studies have been published on brucellosis throughout the years. Dr. James E. Teague's thesis, "The Economic Impact of the Disease Called Brucellosis on the Ranching and Dairy Industry of the State of Texas", from The University of Texas School of Public Health, Houston, Texas, 1978, contains an in-depth literature review and livestock producers survey of the disease. The nature of the disease, history and background of the disease and eradication programs have been addressed in detail in his thesis. Therefore, this study will reference his work and concentrate on the revised eradication program and the present disease status in man and livestock, primarily cattle.

As a result of the NBTC and the U.S. Animal Health Association recommendations, the USDA, APHIS developed new guidelines and procedures to eradicate brucellosis. The guidelines and their changes are published in the federal Uniform Methods and Rules (UMR). The Texas brucellosis eradication program was revised in 1980 by the TAHC to comply with the new UMR.

The TAHC objectives emphasize the importance of a complete program for each infected herd. This concept is reiterated in the 1981-82 TAHC annual report to the Governor and includes epidemiological investigations, the development of herd management plans, the establishment of fully vaccinated herds, and the testing of adjacent herds to detect possible sources of reinfection.

Because of previous problems and experiences with the old (prior to 1980) eradication program, producers have become very skeptical of any brucellosis eradication program. To combat this situation, the TAHC has intensified educational efforts for producers, livestock industry groups, and governmental agencies.

This research project will test the objectives and program elements of the TAHC by submitting questionnaires to randomly selected owners of infected herds. Livestock personnel who represent members of the cattle industry, regulatory officials, practicing veterinarians and research veterinarians will also be interviewed to present the ideas of prominent livestock representatives to the TAHC.

DEFINITION OF TERMS AND ANCRONYMS

- APHIS - Animal Plant Health Inspection Service
- AVMA - American Veterinary Medical Association
- BRT - Brucellosis Ring Test. A program that tests composite raw milk samples from dairies to detect infected herds.
- ELISA - Enzyme Linked Immunosorbent Assay. A highly sensitive laboratory test used to detect brucellosis reactor cattle.
- ICA - Independent Cattlemen's Association
- MCI - Market Cattle Identification. A program that tests cattle through abattoirs.
- NBTC - National Brucellosis Technical Commission
- TAES - Texas Agricultural Experiment Station
- TAHC - Texas Animal Health Commission
- TSCRA - Texas Southwest Cattle Raisers Association
- TVMA - Texas Veterinary Medical Association
- UMR - Uniform Methods and Rules. A federal guideline for implementing the nation's brucellosis eradication program.
- USAHA - United States Animal Health Association. An organization that represents livestock agencies and that is responsible for determining the nation's animal health and disease prevention programs.
- USDA - United States Department of Agriculture.

CHAPTER II

COMMUNITY HEALTH PROBLEM

The medical and veterinary professions are concerned about the disease brucellosis because it is truly a zoonotic disease. Control of the disease therefore, depends primarily on elimination of the animal reservoirs. The disease has been endemic in Texas livestock for many years and is a major source of brucellosis in Texas residents. Another important source for human brucellosis in Texas is related to animal by-products that originate in Mexico, where the disease is highly endemic. Table 1 lists eight reported cases with Mexico origin in 1982.

The prevalence of human brucellosis in Texas is recorded back to 1951 at which time the Texas State Health Department made it a reportable disease. The number of cases for specific years are listed below.

1951 - 123	1970 - 19	1980 - 28
1960 - 22	1976 - 77	1981 - 45

The high count in 1951 dropped gradually over a four year period to an average of approximately 36 cases per year. Figure 1 shows the distribution of 27 reported human brucellosis cases for 1982 in Texas. Attack rates for some of the years noted above are listed.

1976 - .61/100,000	1980 - .20/100,000
1978 - .18/100,000	1981 - .31/100,000

Although the attack rates are not dramatically high, certain members of the community are at a higher risk than others. These include occupational groups who have exposure to animals. They are cattle owners and their families, farmers, packing plant workers, meat inspectors, veterinarians, employees of livestock and dairy industry, and consumers of raw meat, unpasteurized milk and other dairy products made from unpasteurized milk.

Prevention of human brucellosis is dependent upon elimination of brucellosis in animals, preventing organism transmission from animal to man, and increasing the resistance of people who are high exposure risks. Unfortunately there is not a vaccine for human use in the United States. According to Steele (1979), vaccination of humans using Strain 19 vaccine has been practiced widely in the U.S.S.R.

Education is a very important process of prevention and is essential to understanding the epidemiology of the disease and to preventing it. This is especially important for those responsible for decision making in industrial processes, movement and marketing of animals, workers in the livestock, dairy, and meat packing industry as well as consumers of animal products.

On the national average, packing house employees are the occupational group with the highest reported incidence of brucellosis. Since 1976, the majority of human cases in Texas have been livestock owners, veterinarians, and their employees. The prevalence in the livestock occupation is followed closely by the disease prevalence in abattoir employees.

The 27 cases of human brucellosis listed in Table 1 are segregated according to origin of infection. Nine cases (33%) are from occupational exposure and eight cases (30%) consumed dairy products (unpasteurized milk and cheese, often of Mexico origin). Of the nine(33%) occupational exposures, 6 cases (66%) were related to livestock exposure. Other possible sources of exposure were reported in four cases and included: pet dogs in a *B. canis* case, goat contact in Mexico, pork contact from a packing plant by an employee's spouse, and non occupational contact with cattle. The remaining six cases had no reported exposures consistent with brucellosis.

Brucella organism was cultured from all the human infections.

Brucella melitensis is the most invasive and pathogenic of the three livestock Brucella organisms. It is not currently found in livestock from the U.S. All six cases of B. melitensis originated directly or indirectly from Mexico. One case was acquired in the laboratory.

If brucellosis was indeed eradicated, there would be one less disease afflicting man in Texas and the U.S. The threat would still plague persons who continue to consume unpasteurized dairy products originating in Mexico.

TABLE 1

BRUCELLOSIS in Humans, by County of Residence, Texas, 1982

<u>Case#/Wk#</u>	<u>Age</u>	<u>Race</u>	<u>Sex</u>	<u>County of Residence</u>	<u>Laboratory</u>	<u>Exposure (reported)</u>
1 / 14	20	H	F	Bexar	BA 1:1280 <u>B. suis</u>	?Fork from packing plant? Spouse of 1981 Case# 30
2 / 15	28	H	M	Jefferson	BA 1:1280 <u>B. melitensis</u>	Cheese in Mexico, 9/81
3 / 19	60	W	M	Jefferson	BA 1:320 <u>B. abortus</u>	Herd of cattle, one cow aborted 11/81
4 / 20	36	H	M	Bexar	BA 1:1280	Packing plant, kill floor Swift Independent
5 / 21	58	W	M	Washington	BA 1:2560	Retired cattle handler
6 / 21	37	W	M	Van Zandt	BA 1:160	Veterinarian, general practice
7 / 23	6	H	F	Tarrant	BA 1:640	Raw cows' milk in Mexico, 2-3 months in spring '82
8 / 23	7	H	M	Hidalgo	BA 1:5120	Contact with goats in Mexico
9 / 23	18	H	M	Hidalgo	BA 1:640 <u>B. melitensis</u>	Cheese in Mexico, occupation: contact w/ cattle
10 / 24	5	H	F	Hidalgo	BA 1:2560 <u>B. species</u>	No reported exposure con- sistent with brucellosis
11 / 32	66	H	M	Hidalgo	BA 1:160	Mexican national, in US 3 mo PTO, denies exposure possible
12 / 33	11	W	F	Wood	<u>B. canis</u>	?dogs at home?, dog serology was to have been done?result:
13 / 35	71	W	M	Gillespie	BA 1:5120	Unknown
14 / 38	48	W	M	Jackson	BA 1:640	Contact w/ raw cows' milk, denied drinking
15 / 38	30	H	M	El Paso	BA 1:640 <u>B. melitensis</u>	Cheese in Mexico, spring '82
16 / 39	43	W	M	Smith	BA 1:2500 <u>B. abortus</u>	Contact w/ neighbor's cattle
17 / 40	32	W	M	Gregg	BA 1:320	Unknown
18 / 41	26	W	F	Harris	BA 1:2000 <u>B. melitensis</u>	Exposed in hospital lab.
19 / 41	51	H	F	Bexar	<u>B. melitensis</u>	Milk/cheese in Mexico
20 / 43	32	B	M	Angelina	BA 1:1280	Packing plant
21 / 44	48	W	M	Hill	BA 1:640	Rancher, multiple exposures infected herd, abortions, et
22 / 44	68	W	M	Madison	BA 1:320 <u>B. species</u>	Rancher, exposed to infected herd
23 / 40	10	H	F	Dallas	BA 1:1280 <u>B. melitensis</u>	Mexican national in US 2 mos PTO, goat cheese/contact Mex
24 / 48	40	O	M	Nueces	BA 1:640	Occupational exposure to cattle products, bone-meal
25 / 48	28	W	M	Gregg	BA 1:1280 <u>B. suis</u>	Unknown, no animal contacts
26 / 42	81	H	F	El Paso	BA 1:320	Mexican cheese, Spouse of 1983 Case# 1
27 / 48	41	H	F	Uvalde	BA 1:320	Unknown, no info available

Bureau of Epidemiology, Texas Department of Health, 5/83

CHAPTER III

THE NATURE AND DISTRIBUTION OF THE BRUCELLOSIS PROBLEM

Although brucellosis is described in detail by other authors, such as in Dr. Teague's thesis (1978) and the NBTC, the disease will be discussed briefly so current information on the disease and its distribution in Texas can be displayed.

Brucellosis is a highly contagious bacterial disease that affects cattle, horses, sheep, swine, goats, dogs, and man. It is also called Bangs Disease, Contagious Abortion, and Malta Fever. In humans, it is called Undulant Fever.

The bacteria that cause brucellosis belong to the genus Brucella. There are three main species in livestock: (a) Brucella abortus; (b) Brucella suis; and (c) Brucella melitensis. The most common organism that has caused the greatest threat in Texas is Brucella abortus. The bacteria is a gram negative aerobic bacillus that is nonmotile and lacks spores or capsules. It is unable to survive outside the infected animal in the presence of normal environmental conditions. Hot and dry weather conditions readily kill the organism. Because of this critical factor, approximately 10,000 Brucella organisms are needed to infect an animal.

Brucellosis in cattle results in abortions, weakened calves, reduced milk production, and in some instances sterility in bulls. According to the TAHC, affected herds can have 40 percent fewer calves and milk production may be reduced 20 percent in both dairy and beef animals. Infected cows usually abort between the fifth and seventh month of pregnancy. They seldom abort more than once, but subsequent pregnancies may result in weak and unhealthy calves. Even when calves appear healthy, infected cows will be carriers and

will continue to shed infectious organisms via vaginal discharge, afterbirth, and milk.

The geographic distribution of brucellosis can be determined from the state distribution map in Figure 2. The state has been divided into Area B and Area C. Depending on the accumulated herd infection rate, the UMR classifies states and areas into four areas.

<u>CLASS</u>	<u>HERD ACCUMULATED INFECTION RATE NOT TO EXCEED</u>
Free	0.0%
A	0.25%
B	1.5%
C	Greater than 1.5%

This classification system was devised to identify high and low risk areas so that flexibility of cattle movement is allowed in one area but restrictive in an area where the disease is more prevalent.

The problem has consistently been greater in the eastern part of the state. Figure 3 depicts the problem in Area B and Area C during the county by county testing program in comparison to the brucellosis infected herd status in FY '82. In the 10-20 years, Area C has experienced the greatest reduction in diseased herds but not sufficient for Area B classification. A closer look at the disease, the environmental factors, herd population, and community involvement will help explain the persistent problem in Area C (East Texas).

Most cattle become infected by swallowing the organism with contaminated milk or by licking infected newborn calves or from bedding contaminated with large numbers of organism from the aborted fetus, newborn calf, afterbirth,

or discharges from the reproductive tract. The organism is capable of passing through intact mucous membranes of the nose, mouth, eyes and abraded skin of susceptible animals.

The incubation period ranges from 10-285 days. This period is greatly influenced by factors such as exposure dose, animal resistance, age, and pregnancy. The greater the exposure dose, the shorter the incubation period. If exposure occurs early in pregnancy, the incubation period will be longer and vice versa.

Bulls are not a direct threat to the spread of the disease. Although their semen may be infected, it must be introduced into the uterus. Therefore, artificial insemination with infected semen is a far greater threat than natural insemination by the bull. Bulls should be tested prior to semen collection to ensure brucellosis free semen.

Population density is a big factor in the transmission and spread of the disease. In East Texas, (114 counties) there are approximately 106,498 herds, with 2902 accumulative infected herds, as opposed to approximately 55,335 herds, with 399 accumulative infected herds, in West Texas (140 counties) (see Figure 3.). In fact, there are 32 counties in Area C (East Texas) that have approximately one-half of the total Texas quarantined herds. These counties are earmarked by TAHC for accelerated eradication programs and are depicted in Figure 4. In contrast to the accumulative infected herds listed in the Appendix, there are approximately 2000 infected herds in Texas at any given time.

Increased cattle population in Area C is attributed to improved pastures and abundant grass. The human population is greater in this area and there are numerous small farms and small herds which are supervised primarily

on weekends. With each herd, there is the risk of human error with poor herd management playing an important role in disease transmission. Within a given area, there are more herd owners which increase the chances of introducing the disease by improper herd management and facilities. The same area in Area B (West Texas) may have one ranch, one herd, and one owner/manager.

Ponds and streams are of minor importance in brucellosis transmission, except when they are sites for herd congregation. In addition to ponds and streams, trees influence cattle to congregate. This is especially important when trees are shared by herds in adjacent pastures and across the fence contact is made.

Wildlife reservoirs have been incriminated in spreading brucellosis to some degree. According to the NBTC, there is no documented evidence that wildlife form a natural reservoir for B. abortus except in the case of elk and bison, and only then when certain conditions exist, such as close confinement in Yellowstone National Park. Wild animals such as coyotes, wolves, etc. have been blamed for spreading the disease by dragging placentas or aborted fetus into adjacent pastures. This is a distinct possibility since experimentally B. abortus has survived for less than one day in direct sunlight. However, there is no evidence that survival of the organism in nature is a major source of infection for cattle.

CHAPTER IV

TEXAS BRUCELLOSIS PROGRAM AUTHORITY

The TAHC was created by the Legislature in 1893 and from the Legislature it receives its authority. As far as the cattle industry is concerned, it is responsible for implementing the goals and the various programs listed in the federal UMR. The Commission is composed of nine commissioners and all its employees. Each commissioner is appointed by the Governor, confirmed by the Senate and has practical experience in the livestock area he represents.

There are three major lawsuits that had impact on the Texas Brucellosis Program because of questionable constitutional authority.

The first suit resulted from the federal quarantine threat of Texas cattle in December, 1975. It was filed in Castro County District Court and the resulting temporary injunction prevented implementation of the quarantine provision. The TAHC was directed to enforce rules meeting federal standards. The temporary injunction was issued 28 January 1976, and was amended twice to enforce the new Texas Bovine Brucellosis Regulations dated 29 February 1980.

The second suit was filed in Uvalde County District Court on 9 September 1979. The court ruled that the old brucellosis regulations and Vernons Texas Civil Statutes on brucellosis which authorized the program were unconstitutional as applied to R. J. Nunley, a well known Sabinal rancher, and enjoined the TAHC from enforcing the brucellosis regulations against Mr. Nunley. When the new regulations were initiated in 1980, an attempt was made to apply the regulations to people buying Mr. Nunley's cattle. It resulted in the TAHC being held in contempt of the court order. An appeal by the TAHC in the San Antonio Court of Civil Appeals was dismissed, because of improper

jurisdiction. Motions for rehearing were denied and an application for writ of error was filed with the Texas Supreme Court.

The third suit is pending in the Travis County District Court and it involves the Pan American Livestock Exposition vs. TAHC and R. J. Nunley. The plaintiffs are filing to enjoin the TAHC to enforce the brucellosis regulations against all persons including R. J. Nunley. On 14 June 1982, R. J. Nunley was granted a summary judgment declaring the rules and regulations were invalid and unenforceable.

Senate Bill 366, Texas Brucellosis Eradication Program, was introduced by Senator Bob Glasgow in the 1983 Texas Legislature to provide constitutional authority to the program and operate within the guidelines of the federal UMR. The House of Representatives voted in favor of the brucellosis bill, but the Senate failed by one vote to bring the bill up for a final consideration. The federal government immediately set forth procedures to quarantine Texas Cattle as of 1 June 1983.

The Texas Southwest Cattle Raisers Association (TSCRA) claimed Texas had a brucellosis program and its regulations followed federal guidelines. The TSCRA requested a restraining order and it was granted till 20 June 1983.

Texas Governor, Mark White, called for a special session of the Texas Legislature, 22 June 1983, to consider the brucellosis eradication bill. State Senator, John Traeger introduced amendments to the brucellosis program as recommended by the Independent Cattlemen's Association (ICA). The amendments were approved by the federal government and the bill was passed by the legislature. The amendments are too lengthy to list in detail but they allow heifer movement out of quarantine herds, provided they go directly to slaughter or quarantined feedlots. Other provisions for movement to be vaccinated are also allowed. There are different requirements for Area B and Area C and

will not be discussed. Another provision stipulated that three additional members to the TAHC be appointed to get broader representation of the live-stock industry

The bill should have an impact on the program authority and lawsuits quoted above, but the program authority will be determined in future court appeal sessions.

CHAPTER V

TEXAS BRUCELLOSIS PROGRAM - GOALS, COSTS, AND BENEFITS

A. TAHC GOALS AND PROGRAM OBJECTIVES

According to the TAHC annual report (1982), the Texas Brucellosis Program has four major goals.

- To control brucellosis and eventually eradicate the disease with as little hardship as possible to Texas producers.
- To reduce the economic burden of the disease.
- To provide for unrestricted cattle movement in and out of Texas.
- To avoid federal quarantine.

To attain these goals the Texas Brucellosis Program is now emphasizing the importance of a complete program for each infected herd. This concept includes epidemiological investigations and development of a herd plan to eradicate and prevent reinfection in the herd. The herd plan will establish fully vaccinated herds, and adjacent herds will be tested to detect possible sources of reinfection. By increasing immunity levels and eradicating the disease in a local area, eradication should expand to a state wide basis.

Listed below are the program elements that comprise the brucellosis eradication program.

1. Calfhood Vaccination

Calfhood vaccination is the main program element and could be considered the cornerstone of the brucellosis eradication program in Texas. The vaccine used in the new eradication program is called the reduced dosage

Strain 19 vaccine. It is a live vaccine but contains only one billion organisms per dose. The old vaccine contained approximately 90 billion organisms per dose and produced titers which were difficult to differentiate from the actual disease in the adult cow. Another disadvantage of the old vaccine was the overwhelming effect it had on the immune system of young calves that resulted in no immunity.

By using the reduced dosage Strain 19 vaccine, the TAHC believes the program has become more acceptable to the cattle industry. At least 70 percent of all eligible heifers should be vaccinated before the herd immunity effect is acquired.

Figure 5 shows the number of calfhood vaccinates in 1980, 1981, and 1982. There has not been a substantial increase in calfhood vaccinates from 1981 to 1982 as it was from 1980 to 1981. The following vaccination statistics are derived from the TAHC annual report (1982) and indicate approximately 32 percent of the eligible heifers are vaccinated.

TABLE 2

BRUCELLOSIS STATISTICS

<u>Estimated No. of Breeding Cows 1/1/82</u>	<u>Number of Eligible Heifers For Vaccination</u>	<u>Heifers Vaccin- ated FY '82</u>	<u>% Eli. Heifers Vacc. FY '82</u>
State Totals: 6,235,100	2,649,921	877,637	33.12%

2. Laboratory System

Another element of the new brucellosis eradication program is the updated laboratory system which is used to analyze blood tests, milk samples, Brucella culture samples, and vaccine viability samples. The laboratory

system includes a central laboratory in Austin and five regional laboratories located in Amarillo, Ft. Worth, Palestine, San Angelo, and San Antonio.

The fact that a full range of diagnostic procedures is readily available is a tremendous asset to the program. The central laboratory has the ability to perform the Enzyme Linked Immunosorbent Assay (ELISA) which was adapted to brucellosis testing by the Texas Agricultural Experiment Station (TAES) and has been demonstrated to be a better indicator of early infection in vaccinated cattle. Further evaluation under laboratory conditions in the field will be necessary. Other serology tests, such as the rivanol and complement fixation are also used to differentiate reactor titers from vaccinal titers.

The TAHC is placing greater emphasis on tissue collection for culturing and identifying Brucella biotypes. According to Steele (1979) biotypes 1, 2, and 4 are found in the United States and in Texas. Biotyping assists the epidemiologist to determine the source of infection and has been a great asset in showing a herd owner where his infection originated.

The new laboratory system has made a tremendous difference in expediting test results. Under the old program, some procedures, such as biotyping, were sent to other laboratories e.g. in Ames, Iowa. A lag time of one to three months would elapse before results were obtained. Table 3 breaks down the number and types of laboratory analyses in 1982.

TABLE 3

Laboratory Analyses of Samples for Brucellosis

	1st Qtr. FY '82	2nd Qtr. FY '82	3rd Qtr. FY '82	4th Qtr. FY '82	Total FY '82
(1) Blood Samples Received					
(2) Blood Samples Not Testable (Hemolyzed)	1,027,044	728,101	964,535	900,601	3,620,281
(3) Blood Samples Tested	115,822	60,674	90,106	133,400	400,002
(4) Supplemental Tests:	911,222	667,427	874,429	767,201	3,220,279
Rivanol	22,444	19,100	22,310	20,728	84,582
Insufficient Serum for Rivanol	579	914	610	465	2,568
Complement Fixation (Manual)	10,381	7,765	10,740	8,983	37,869
Complement Fixation (Automated)					
Samples Analyzed	61,226	64,597	66,899	46,997	239,719
Suspicious Samples Titrated	8,391	3,332	4,647	4,393	20,763
(5) Milk Samples for Brucellosis Ring Test (BRT)	6,546	4,162	7,937	4,975	23,620
(6) Samples for Brucella Culture	465	382	602	521	1,970
Biotype I Isolations	67	68	105	90	330
Biotype II Isolations	15	3	18	16	52
Biotype IV Isolations	0	2	0	23	25
Strain 19 Isolations	38	24	14	4	80
(7) Vaccine Viability - Vials Sampled	0	35	32	18	85
Total Samples Received (1+5+6)	1,034,055	732,645	973,074	906,097	3,645,871

Texas Animal Health Commission Annual Report, 1982

3. Surveillance Program

The surveillance program element has been a part of the brucellosis eradication program since it originated in 1959. The Brucellosis Ring Test (BRT) and the Market Cattle Identification (MCI) system made up the primary surveillance program. It includes testing of milk samples collected at milk processing plants and the testing of cattle at slaughter plants, livestock markets and private farm or ranch tests. The 1982 surveillance program resulted in the following number of herds tested. Seventy three herds were tested due to suspicious BRT samples, 518 herds tested due to slaughter plant reactors, 3,167 herds tested due to livestock market reactors, 409 herds tested due to reactors found on private tests, and 1,015 herds were tested as a result of other surveillance measures such as epidemiologically traced herds (278), adjacent herd testing (496), and post quarantine herd retest (241). The following table from the TAHC 1982 report gives the total herds tested, infected herds, and percent infection for FY '80, FY '81, and FY '82. Although the percent of infected herds remained the same for 1981 and 1982 the total herds tested and infected reactors in 1982 has declined from 1981 figures. Either the surveillance program is not working as well as 1981, or there is less infection in the field. Because of previous legal problems and court rulings, the TAHC may have been reluctant to fully pursue its goals until the legislature met in 1983.

TABLE 4
BRUCELLOSIS SURVEILLANCE STATISTICS

<u>TOTAL HERDS TESTED</u>			<u>INFECTED HERDS DISCLOSED</u>			<u>% INFECTION</u>	
<u>Year</u>	<u>Herds</u>	<u>Cattle</u>	<u>Herds</u>	<u>Cattle</u>	<u>Reactors</u>	<u>Herd</u>	<u>Animal</u>
<u>Totals</u>							
FY '80	4,572	167,956	1,927	90,985	14,314	42.1	15.7
FY '81	5,549	224,026	2,626	122,315	19,741	47.3	16.1
FY '82	4,167	171,594	2,108	103,711	16,632	50.6	16.0

4. Epidemiologic and Herd Health Surveys

Another objective of the TAHC was to perform epidemiologic and herd health management surveys on infected herds. The following tables show the number of investigations performed for the past three years.

TABLE 5
EPIDEMIOLOGICAL INVESTIGATIONS

FY '80	0
FY '81	2,660
1st Qtr. FY '82	801
2nd Qtr. FY '82	748
3rd Qtr. FY '82	837
4th Qtr. FY '82	<u>879</u>
Total FY '82	3,265

TABLE 6
HERD PLANS DEVELOPED

	<u>Herd Plans</u>	<u>Herd Plans With Adult Vaccination</u>
FY 1980	0	210
FY 1981	1,439	222
1st Qtr. FY '82	363	57
2nd Qtr. FY '82	276	48
3rd Qtr. FY '82	335	130
4th Qtr. FY '82	246	76
Total FY '82	<u>1,220</u>	<u>311</u>

5. Accelerated Eradication Program

The TAHC initiated an accelerated eradication program in 33 counties identified in Area C (Figure 4). These counties have approximately one-half of the total Texas quarantined herds. The accelerated program consists of intensive educational proceedings to be implemented in one county in each of the five TAHC regions. The counties are Hopkins - Region 4, Robertson - Region 7, Smith - Region 8, Colorado - Region 10, and Henderson - Region 15. Each county was designated as the "pilot project" county.

Information and publicity on the new Strain 19 vaccine was aired via 10 second public service announcements. A news release for publication was also submitted by the TAHC. A meeting was scheduled with TAHC officials in the five pilot project areas to outline the aspects of the program with emphasis on calfhood vaccination. The meeting was scheduled for 1:00 p.m. on designated days within the counties specified.

Two brochures, "Brucellosis, the Disease" (40,000 copies) and "Vaccination" (25,000 copies) were provided to County Agents in the accelerated area for distribution to area farmers and ranchers. A booklet, "Everything, (Well Almost Everything) You've Ever Wanted to Know About Brucellosis" was prepared and distributed to various organizations, other states, some foreign countries, and several farm and ranch organizations in Texas. The booklet was published in the "Cattleman" magazine and was also sent to 1,653 vocational agriculture teachers. The booklet is very informative and should be sent to all infected herd owners.

B. COST AND BENEFIT ANALYSIS

A cost and benefit analysis of the brucellosis program was performed by the Texas Agriculture Experimental Station (TAES) and revealed the TAHC

program has the potential to improve program efficiency as evidenced by (1) substantial reduction in brucellosis infection and associated physical losses, and (2) benefit/cost ratios that show positive returns from investments in the program. In preparing the benefit/cost analyses, the FY 1982 TAHC program was projected over the 1982-1994 time frame and the 1982 infection levels, and cattle industry conditions were used as a base against which program changes are measured.

Table 7 indicates the program would have a positive program performance as evidenced by a substantial decrease in affected herds, infected cows, and weaner calf and milk losses. The number of quarantined herds and cows declined 60 to 64 percent respectively. Weaner calf losses declined 62 percent. Milk losses declined 80 percent as a result of the program. Since East Texas (Area C) accounted for 95 percent of the brucellosis infection, declines in affected herds, cows, calf losses and milk losses were, in general, slightly higher than in West Texas (Area B).

The benefit/cost ratio for the 1982 Brucellosis program as projected for the 1982-94 time frame was 2.33 as depicted in Table 8. For each dollar spent on the program, including TAHC and USDA/APHIS funds, the benefits from reduced weaner calf and milk losses increased \$2.33. When producer costs were included the ratio decreased to \$2.22. The slight decrease resulted, primarily, from increased producer roundup and labor costs associated with the FY 1982 calfhoo vaccination level.

TABLE 7

Numbers and Projected Changes in Numbers of Affected Herds and Cows, and Weaner Calf and Milk Losses Associated With The 1982 TAMC Bovine Brucellosis Program, By Region, Texas.

Item and Region	FY-1982 Base Data and Projected Change From FY-1982 ^{1/}					
	Undetected Infected Herds	Quarantined Herds	Quarantined Infected Cows	Undetected Infected Cows	Calf Pound Losses	Milk Pound Losses
	----- number -----				1,000 Pounds	1,000 Pounds
<u>FY-1982</u> <u>Base Data:</u>						
West Texas	289	179	1,740	1,809	473	179
East Texas	5,619	3,164	30,221	34,974	8,230	3,231
Total	5,908	3,343	31,961	36,783	8,703	3,410
	----- Percent Change From FY-1982 -----					
<u>Projected</u> <u>Change For:</u> ^{1/}						
West Texas	-50.5	-54.7	-59.4	-55.3	-56.9	-76.1
East Texas	-54.6	-59.8	-64.1	-59.4	-62.0	-80.2
Average	-54.4	-59.6	-63.8	-59.2	-61.7	-79.9

^{1/} FY-1982 is the base from which changes are measured. The time horizon analyzed is 1982-94.

Addendum to Texas Animal Health Commission Annual Report, 1982

TABLE 8

Benefit/Cost Ratios Associated With The 1982 TAMC Bovine Brucellosis Program ^{1/}

Item	Change in Benefits ^{2/}	Marginal Program Costs ^{3/}	Benefit/Cost Ratio ^{4/}
1982 TAMC Program Including:	1,000 Dollars	1,000 Dollars	Ratio
State and Federal Expenditures	25,000	10,000	2.33
State and Federal Expenditures and Producer Costs	25,000	11,441	2.22

^{1/} Computed for the 1982-94 time horizon and represents discounted present values in 1982 dollars assuming a real discount rate of four percent.

^{2/} Change in benefits of the current program over the base program.

^{3/} Current program costs minus the base program.

^{4/} Change in benefits divided by marginal program costs.

Addendum to Texas Animal Health Commission Annual Report, 1982

CHAPTER VI

RESEARCH PROJECT DESCRIPTION

This research project studied the effects of the new brucellosis eradication program on the animal industry, veterinarians, regulatory officials, and individuals who have experienced brucellosis in their herd. The project will be divided into two separate phases:

A. Interviews

The first task was to interview representatives of the cattle industry (pro and con to the program), veterinarians in research and in private practice, and state and federal regulatory officials. The eleven questions listed as Interview Topics in Appendix A were used to determine their general feelings toward the brucellosis eradication program.

Appendix A includes the complete packet that was submitted to the persons interviewed prior to the actual interview. Interviews were made in person with the exception of one individual whose time schedule only allowed for a telephone interview. Interview notes were written in final format, and submitted to each individual to assure responses were documented correctly. Six reports were returned for correction.

The interview results are documented in Chapter 7. To maintain anonymity in this report, each person interviewed is referenced by a code number.

B. Questionnaire

This phase was more detailed and involved a survey of livestock owners who had previous experience with brucellosis and the Texas regulations governing the eradication of the disease. Appendix B includes the questionnaire packet that was submitted to the owners of infected herds selected to participate in the survey.

The survey questions were designed to determine if the brucellosis eradication program objectives and elements identified in Chapter 5 were implemented at the level of the herd owner. Survey results are displayed in Appendix C.

The brucellosis eradication program objectives and elements should be implemented uniformly throughout the State; therefore, an attempt will be made to prove or disprove the following null hypothesis for each question. There is no significant difference in questionnaire results received from Area C as opposed to Area B. The 2 x C table and the chi square table were used for calculations and statistical evaluation of each question.

In the study, all Texas herd owners are considered the universe. The success or failure of the eradication program will affect the universe members. The population was identified as herd owners in Texas who have experienced brucellosis in their herd. The sample population was derived from owners of herds which were quarantined during the month of December 1982. It is expected that most herd owners were under quarantine prior to December 1982, but not prior to the new brucellosis eradication program in 1980. Therefore, the objectives and new program elements should be represented in the

responses to this survey. The infected herd owners who returned the questionnaires will be referred to as the respondent population. Herd owners that did not return questionnaires will be referred to as the non-respondent population.

The survey sample size was determined by choosing the significant level of alpha (.05) and power (.90) and then applying these figures to six key questions in a questionnaire from Teague (1978). The relative frequency response for the six questions was used as a base line for establishing the P_1 figure for a two tailed test on proportions ($P_1 - P_2$). The ten percent increase was used as the P_2 value. Based on these data, a sample size of 400 was selected as sufficient to give significant results. Based on Teague (1978), a 50% return rate was expected. Therefore, a sample population of 800 herd owners was selected at random from the list of owners with infected herds on record at the TAHC.

The survey was compiled from data collected from a total population of 2,100 infected herds on record in December, 1982. The sampled population was 800 herds and the total respondent population was 385. The sampled population of 800 was divided proportionally between infected herd owners in Area C and Area B according to the number of infected herds in Area C and Area B in December 1982.

Area C contained 1,930 infected herds (92% of the total infected herds) and Area B contained 170 infected herds (8% of the total infected herds). There were 735 questionnaires submitted to Area C herd owners and 65 questionnaires sent to Area B herd owners. Three

hundred forty-eight (47%) of the questionnaires were returned from Area C and 37 (55%) questionnaires were returned from Area B.

In addition to comparing owners of infected herds from Areas B and C, the old (prior to 1980) and new (subsequent to February 1980) eradication programs were evaluated. Only nine questions from the 1977 questionnaire were applicable and used in this survey. Appendix D contains the results of the questions used for comparison.

The following questions were used in comparing the 1977 and 1982 survey. They are: numbers four, eight, nine, ten, twelve, fifteen, sixteen, twenty-one, and twenty-four. A significant difference between the 1977 and 1982 questionnaires was expected. The stated null hypothesis is, "there is no difference in the 1977 and 1982 questionnaire results." Calculation using the 2 x C table and the chi square statistical table will also be used to interpret the significance of each question tested.

CHAPTER VII

AGENCY INTERVIEWS

In order to get diversified opinions on the brucellosis program, personnel from various agencies who impact, interface, and work with the disease were interviewed. These professional individuals are knowledgeable of brucellosis and the Texas Brucellosis Eradication Program within the limits of their job or association with the disease.

The interview topics listed in Appendix A were used in the interview. The same questions were asked of all members, but based on their sometimes limited knowledge, experience, or area of expertise, all questions may not have been answered by each individual.

A. AGENCY REPRESENTATIVES

The following agency members and individuals were interviewed. Their discussion of the disease and the program will be compiled with each interview topic.

1. Veterinary Practitioners

- a. Practitioner A will be referenced as such throughout this report. Veterinarian A owns a mixed practice in TAHC region 10 of Area C. He is a member of two brucellosis committees at the state and national level.
- b. Practitioner B will be referenced as such throughout this report. Veterinarian B is in a mixed partnership practice located in TAHC region 10 in Area C. He is a member of the AVMA and TVMA.

2. Research Agency

- a. Researcher A will be referenced as such throughout this report.

Researcher A is a member of the Department of Veterinary Public Health at Texas A&M University.

- b. Researcher B will be referenced as such throughout this report. Researcher B is a member of the Department of Veterinary Pathology at Texas A&M University.

3. Livestock Industry

- a. Texas and Southwest Cattle Raisers Association (TSCRA) representative will be referenced as such throughout this report.
- b. Independent Cattlemen's Association of Texas (ICA) representative will be referenced as such throughout this report.

4. Regulatory Agency

- a. Regulatory member A will be referenced as such throughout this report. Regulatory member A is on the Board of the TAHC. He is on the Brucellosis Committee of the U.S. Animal Health Association and is a member of the National Cattlemen's Association and member of its Brucellosis Subcommittee.
- b. Regulatory member B will be referenced as such throughout this report. Regulatory member B is a federally employed Veterinarian who works with Brucellosis eradication in Texas.

B. INTERVIEWS

- 1. What benefits do you think can be derived from brucellosis eradication?

All individuals interviewed felt that benefits would be derived from brucellosis eradication. A common benefit referenced was reduced calf and milk loss. Savings from this alone indicated that for

each dollar of program expenditure for 1981 above the base program, benefits from reduction in weaner calf and milk losses increase \$5.32.

Among the veterinarians and researchers the public health significance was heavily emphasized. Researcher A pointed out that in Texas human infection occurs primarily from cattle contact (milk, vaginal discharge, and new born contact), whereas in the past swine was the cause of human infection in abattoir employees.

The veterinarians interviewed stated production cost would be decreased. If brucellosis was eradicated, infected herd owners would save labor costs of handling cattle for testing and vaccination. In a previous survey, it was shown that 67.9 percent of the sampled herd owners spent \$300 or less per year to prevent brucellosis.

Practitioner A further expounded on the cost-benefit of brucellosis eradication. He stated as a disease decreases to the point of eradication, the losses will be less but administration of the program will remain the same. This must be continued until eradication is complete or else the program backslides and previous efforts are in vain.

ICA representative - "Milk is now pasteurized and human brucellosis is less a public health problem. The few cases of human brucellosis should not be used to justify the program. By eliminating the present program, which cost \$91 million/year, the money saved could be used for research and other worthwhile programs."

Regulatory representative A and TSCRA representative emphasized the freedom of movement benefit. If the Texas Brucellosis Program doesn't continue under federal guidelines, a quarantine of Texas

cattle would be a tremendous hardship on the 98.5% non-infected herd owners.

Regulatory representative B - "There is a definite loss of livestock production in infected herds. The public health significance is important, but the threat of undulant fever has decreased substantially with milk pasteurization. Although, if brucellosis was allowed to go unchecked, the cases of undulant fever would surely increase."

Summary - There are definite benefits to be derived from brucellosis eradication. The most important would be eliminating human infection. Other benefits are reduced cost due to calf and milk losses, herding expense for vaccinating and testing, freedom of cattle movement and reduced administrative cost.

2. Do you think brucellosis eradication is biologically feasible?

Consider the following scientific tools and program objectives:

Strain 19 reduced dosage calfhood vaccination and adult vaccination, card test, rivanol test, complement fixation test, serotyping, test and slaughter, and the market cattle identification program (MCI).

This question was addressed in detail by the National Brucellosis Technical Commission Report in 1978 and many persons interviewed referenced this report as well as their own ideas.

Practitioner A - "The reduced Strain 19 vaccine is good for protecting calves when vaccinated at the optimum age of six months. Since titer is dose related, this vaccine gives protection with less titer development.

Infection level is not dose related. It takes approximately

10,000 organisms for an infection to occur. The brucella organism is very fragile and is susceptible to environmental conditions and is unable to survive outside the host.

In selected herds, adult vaccination with reduced dosage Strain 19 vaccine is good for producing immunity as well as stimulating an anamnestic reaction in latent infected cattle.

The disadvantages of Strain 19 vaccine are important factors to consider. It is a live vaccine and can cause infection in humans that are accidentally injected or in contact with mucous membranes. Because of this hazard, the vaccine must be administered by a veterinarian and is not available on the open market.

Due to the low concentration of organism (approximately one billion) in the reduced dosage vaccine, it is very unstable. If the vaccine is not kept refrigerated, the organism dies, resulting in an ineffective vaccine.

The laboratory methods of detecting brucellosis have been greatly improved for vaccinated animals. The card test is only a screen test and the other definitive test must be accomplished in the State approved labs before an animal is classified as positive".

Practitioner B - "Since reduced dosage Strain 19 vaccine is the best vaccine available, it should be used for prevention. I do not think the MCI program is very reliable for collecting blood and identifying reactor cattle at the abattoir. Tighter controls and greater incentive is needed to operate the MCI program effectively in the packing houses."

Researcher A - "The procedures listed in the question are scientifically sound for detection, protection, and elimination of brucellosis. There are three tools to eradicate the disease.

1. Vaccination is used to raise the resistance of susceptible cattle. Reduced dosage Strain 19 vaccine is the best we have but Texas A&M and other research institutes are trying to develop an effective killed vaccine.
2. Diagnostic testing is used to detect and reduce reservoir host. The card test and the Elisa test, now being developed, are highly sensitive tests to be used for screening. The diagnostic tests are the rivanol and complement fixation.

Biotyping is the most definitive diagnostic tool available. It is sometimes difficult to culture Brucella, but culturing and biotyping identifies the type of field strain as well as the vaccinal strain. There are three biotypes and only one usually infects a herd. By comparing the infection to surrounding herds or areas of infection, the epidemiologist can many times determine the source of infection.

3. Livestock herd management, scrupulous buying-selling practices, and segregation and retesting of purchased cattle are important in preventing brucellosis from being introduced into a herd."

Researcher B - "All the tools are not yet available to facilitate immediate eradication of brucellosis, but the present tools or programs we have will eventually eradicate the disease.

The TSCRA representative was adamant about the industry's

negative feeling toward the old program. The industry is encouraged by the NBTC report of being able to control and eradicate the disease if at least 70 percent of the cattle are vaccinated. The TSCRA is for test and slaughter if a good reliable vaccination program is enforced to protect their cattle. Reduced dosage Strain 19 vaccine should be continued.

ICA representative - "The ICA is against test and slaughter. Brucellosis can be controlled by vaccinating alone. Testing, quarantining, restricting movement, and slaughter is harassment and a waste of money that could be used for research."

The ICA representative indicated the program has become bureaucratic, provided government jobs, and was justified in the 1940's and 50's because of possible human infection. In the 1960's and 70's the bureaucrats became more powerful and the program lingered on until the cattlemen's revolt in 1975. Action was taken but not all cattlemen are satisfied. The ICA wants a foolproof test, where a herd can be tested, reactors removed, and the remaining herd shipped without quarantine.

"Vaccinated cattle that have a titer should not be called reactors. Vaccination is performed to produce protection and the herd owner should not be penalized for complying with vaccination protocol.

Regulatory representative A - As a cattleman and regulatory board member, regulatory representative A held the same view as the TSCRA but emphasized the test and slaughter program must be incorporated to detect infected cattle and reduce the source of the organism in a herd.

Regulatory representative B - "The tools and programs have

been established and are functioning to eradicate brucellosis."

Summary - Brucellosis eradication is biologically feasible. The present program and scientific methods for detecting and eliminating the disease will eradicate the disease.

3. Do you think the present brucellosis eradication program should continue and do you think it will eradicate brucellosis?

Practitioner A - "The program should continue, but eradication would be hastened with mandatory calfhood vaccination in high incidence areas. Regulations should also be changed to prevent heifer movement from quarantine herds to clean herds. Immature heifers can also carry latent infections and should not be allowed free movement unless to slaughter."

Practitioner B - Practitioner B indicated the program should be continued but without more enforcement, it will fail or continue at the same magnitude.

Researcher A - "The program should continue and brucellosis will be eradicated but not without a substantial price. Research is an important facet of the program and is needed to make eradication more feasible by being less expensive and more acceptable to the livestock industry. "

Researcher B - "Throughout the years meaningful progress has been made. In the 1960's and 70's, a 11-13% infected quarantine herd rate was prevalent as opposed to 1.3% infected quarantine herd rate in the 1980's. A decrease of over 10 percent is significant; so, why stop the program now? With continued research, the present eradication tools will change and become better."

TSCRA representative - "The program should continue. Eradication is feasible but puts a burden on the cattle raiser. The TSCRA was pleased to have the state split into Area B and Area C for ease of cattle movement in the less infected Area B. If the 1983 Texas legislature doesn't approve the new program, then the old test and slaughter program would prevail.

ICA representative - "The vaccination part of the new program should continue but not test and slaughter. The present program will not eradicate brucellosis."

Regulatory representative A - "The program should continue and it will eradicate the disease. It worked for my cattle operation."

Regulatory representative B - "The present program will eradicate brucellosis and the program should continue."

Summary - The present brucellosis program should continue, and research should be funded to develop an effective killed vaccine.

4. Why do you think the past brucellosis eradication program (prior to 1980) failed to eradicate brucellosis?

Practitioner A - "The old program was under financed, poorly administered and calfhood vaccination was limited. The old Strain 19 vaccine was used and high vaccinal titers resulted in lasting unpopularity. The old program emphasized control not eradication. But control through test and slaughter resulted in a higher prevalence of bovine brucellosis and subsequently the cattlemen's revolt. There was less research prior to 1975. The NBTC report stimulated funding for more research which tremendously updated the eradication program.

The old MCI program was poorly administered and blood was not

collected with a high degree of reliability.

Practitioner B - "The lack of legislative enforcement was a problem with the past program as well as the present program."

Researcher A - "An inadequate vaccination program and unreliable diagnostic procedures led to a less than satisfactory program in the past. The old program lacked proper administration and inefficiently trained regulatory employees."

Researcher B - "A balanced eradication program was not provided during the late 60's and early 70's. A balanced program forms a tripod. Surveillance techniques linked with herd management and proper hygiene. By implementing the tripod and complying with regulations, the new program can be successful."

TSCRA representative and regulatory representative A - "Under the old program, vaccination was inadequate and administrators were in error by thinking test and slaughter would control the disease. The disease spread more rapidly than it could be detected."

TSCRA representative - "With any long standing program people will visualize inadequacies and support will be lost. The veterinarians in administration and research had closed minds to the problem until the cattlemen's revolt. Majority of cattlemen are for the new program, although many are against test and slaughter. Before the present program can be successful, cattle owner's cooperation is essential."

ICA representative - "The old test and slaughter program is strongly opposed by ICA members. The new program test and slaughter policy is not different and is a continuation of the old bureaucratically operated program."

Regulatory representative A - "The present program will eradicate brucellosis but infected herd owners must comply with established procedures and cooperate with regulatory officials."

Regulatory representative B - "The tools to eradicate brucellosis were available under the old program, but lack of herd owner cooperation prevented eradication."

Summary - The old program did not eradicate brucellosis because it was inflexible, lacked producer's support, and depended on detection as the only means of controlling the disease.

5. Do you agree with the present indemnity payment for reactor cattle (\$50 - grade cattle, \$250 - registered and dairy cattle)?

Practitioner A - "The indemnity program is the government's payment for slaughtering infected cattle. It has legal justification. The present flat rate is more efficient than the herd appraisal method used in the past. Indemnity program could be stopped and not affect the eradication effort."

Practitioner B - "The indemnity payments are not high enough for the honest small herd operator who gets an infected herd."

Researcher A - "The indemnity program can be abused and occasionally is abused. But it encourages participation in the program and for that reason the expenditure is justified."

Researcher B - "I am not totally familiar with the program, but as the eradication effort becomes more successful, I think that the lower the incidence rate of brucellosis, the more justification for paying indemnity."

TSCRA representative - "Indemnity money should be spent for

other areas of the brucellosis program, such as research and training."

ICA representative - "The indemnity program has many fallacies. The people needing the money don't get it and the people who don't need the money, get it. The present figures are more equitable, if all infected herd owners would receive their share. Indemnity is paid directly from federal funds and proper USDA forms must be completed by a federal veterinarian performing the test. If proper forms are not completed, the livestock owner doesn't get paid. Frequently, the owner is not aware of this stipulation."

Regulatory representative A - "Initially indemnity was \$750 for registered and dairy stock. It has now been reduced to a realistic figure. Initially indemnity was justified because it compensated the cattleman for an undesirable program. It is justified from the consumer's standpoint because the consumers will profit from brucellosis eradication. Personally, I feel indemnity money, \$20 million per year, could be used more wisely in research or in the vaccination program."

Regulatory representative B - "The indemnity program has three main purposes: (1) compensate livestock owners for losses due to brucellosis, (2) distribute the cost of the disease among all taxpayers who benefit from brucellosis eradication, (3) encourage participation in the program by livestock owners."

Due to the statement made by the ICA representative, explanation of the indemnity payment process was requested. The following are the criteria for payment.

- "1. A TAHC state employee, a USDA APHIS employee, or any accredited veterinarian may perform herd test and should possess indemnity claim forms required to initiate payment.
2. A complete herd test of all eligible animals must be performed. Eligible animals are defined:
 - a. any pregnant or recently calved heifer,
 - b. all nonvaccinated heifers six months or older,
 - c. all vaccinated heifers 24 months or older - beef cattle,
 - d. all vaccinated heifers 20 months or older - dairy cattle.
3. Reactors should be tagged and branded within 15 days of testing and sold for slaughter within 15 days of tagging and branding. The time periods are usually extended upon request.
4. Verify that reactor cattle are sold for slaughter."

Summary - The indemnity program is costly and does nothing toward eradicating the disease. It should be discontinued and funds diverted to research and the eradication program.

6. Do you recommend any changes in the present brucellosis program?

Practitioner A-"1. Recommend mandatory calfhood vaccination, especially with a change of ownership. 2. Recommend point of origin testing of all cattle at every sale barn. 3. Perform epidemiologic surveys on all infected herds, test all adjacent herds, and send information booklets to infected herd owners as well as adjacent herd owners. 4. Educate practicing veterinarians, because they have more contact with herd owners than regulatory officials."

Practitioner B-"Provide a program that has the ability to enforce its objectives. Legislation must be passed that enables

regulatory officials to punish veterinarians, cattle raisers and cattle traders that do not comply with the regulations."

Researcher A - "Increase the number of trained personnel to perform more epidemiologic surveys. The present infection rate in Texas is overwhelming for the present state employees. Detection, vaccination, and herd management are the three key features that must be maintained."

Researcher B - "1. Recommend a diagnostic test that is sensitive as well as specific enough to detect vaccinal titers from infection titers in herds. 2. More research is needed to know how the organism interacts inside the host. Researchers know what happens, but why it happens is not fully understood."

TSCRA representative - "The present program is good but additional research is needed to facilitate easier and quicker eradication."

ICA representative - "The ICA is for vaccination and free movement. Since vaccinated animals occasionally have high titers, the test, slaughter, and quarantine part of the program removes vaccination incentive."

The MCI and milk ring screening program should be eliminated. There is duplicate testing in the MCI program and it harrasses the sale barn operator. The milk ring test occasionally gives false positives. Testing cattle unnecessarily due to a faulty milk ring test is costly and harrasses the dairy producer."

Regulatory representative A - "Testing cattle before movement or sale would detect the disease at its source. Testing all mature

cattle in a sale barn is also optimal for early detection. Fifteen out of 155 sale barns in Texas have the option to test or brand cattle with an S, for suspect, and sell to slaughter. The MCI program then identified the reactors. This sale barn option was approved to keep the program flexible, but delays detection, and increases the chance for trace back error. This part of the program should be changed."

Regulatory representative B - "No changes are recommended."

Summary - Changes recommended for the present program.

1. Mandatory calfhood vaccination.
2. Heifers should not be shipped from quarantine herds.
3. All cattle sold through a sale barn should be tested.
4. Mandatory testing of all herds adjacent to infected herds.
5. Increase the number of regulatory personnel to perform epidemiologic and herd health surveys.
6. Educate veterinarians as scientific advances occur and inform them of important program changes.
7. What factors do you believe are responsible for the spread of brucellosis?

Practitioner A--"Environment is not a major factor in the south. The organism dies readily in hot climates. Transmitting the organism by rivers and streams dilutes the organism and is not a problem for eradication. In nature, more than 10,000 organisms per dose are required for an infection. Animal transmission other than cattle is unlikely.

Man is the major cause of brucellosis transmission. Most herd owners, especially in Area C, have small herds and are unfamiliar

with the disease. Their herds are poorly managed and cattle movement is indiscriminate. If livestock owners would purchase cattle from known clean herds and follow testing and vaccination procedures, there would be fewer crooked cattle traders."

Practitioner B - "Man is the direct cause of brucellosis transmission. There are unscrupulous cattle traders and veterinarians that will screen herds for cattle traders. The screening process involves testing, separating infected cattle, and selling the remainder exposed and incubating herd. Herd continuity is disrupted and latent infection within the herd disseminates the disease."

Researcher A - Researcher A reiterated the same ideas as Practitioner A&B. He also stated, "When the cattleman stops buying cattle of unknown history and requests cattle of clean origin, then the brucellosis program will be effective. There isn't a regulation written that will stop unscrupulous practices."

Researcher B - "The major reservoir for Brucella abortus is in the bovine which is often mismanaged by man from a disease point of view. If the environment is responsible for the spread of brucellosis, it's possibly due to man unknowingly contaminating the environment by employing poor herd management."

TSCR representative - "Concentration of cattle is a prime factor in the spread of brucellosis. This is exemplified by the low prevalence of brucellosis in New Mexico and West Texas as opposed to East Texas."

ICA representative - "The organism is transmitted in the environment by flooding and streams. It has also been documented that

coyotes and other wild life transport fetuses and afterbirth from pasture to pasture. Man is responsible for spreading the disease by smuggling cattle from infected herds to clean herds."

Regulatory representative A - "Man is the primary factor in brucellosis transmission. Buyers should assume responsibility for purchasing infected cattle. There are a few unscrupulous cattle traders but they are not a real threat to the program. They just take advantage of unconcerned and poorly educated livestock owners. The basic cattleman is honest and wants to do what is right, provided the program is sound, effective, and not a tremendous burden."

Regulatory representative B - "Man is the most important source of brucellosis transmission. The UMR has established guidelines to control animal movement, which is the way man spreads the disease. Without controlled animal movement, brucellosis will not be eradicated."

Summary - Man is primarily responsible for transmitting brucellosis through indiscriminate cattle movement.

8. In your opinion, what can the livestock industry do to help eradicate brucellosis?

Practitioner A - "The livestock industry must have interest in the program and work in harmony with regulatory officials and local private veterinarians.

Industry must inform legislature to fund the program.

Cattle owners must expand their knowledge of brucellosis to maintain a free herd."

Practitioner B - "Livestock industry should police its own organization to eliminate and discourage improper movement and sale of

cattle.

Industry should make public awareness and education a major goal. This would contribute greatly to the eradication of brucellosis."

Researcher A - "The livestock industry must be willing to cooperate and do its part in controlling brucellosis."

Researcher B - "Livestock owners should ensure they have a good working knowledge of the disease and the way it is transmitted in order to avoid purchase or spread of the disease. They should also cooperate with the disease control program."

TSCRA representative - "The livestock industry should abide by the TAHC regulations, support brucellosis research projects, encourage mandatory vaccination of heifers, and segregate and retest recently purchased breeding cattle."

ICA representative - "Cattle raisers need to be in agreement before progress can be made in any type of program. West Texas (Area B) cattlemen do not want vaccination. ICA wants vaccination but no testing."

Regulatory representative A - "The industry must maintain a "can do" attitude of cooperation toward the brucellosis eradication program."

Regulatory representative B - "Livestock members should have a better understanding of the way brucellosis is transmitted and follow the national program recommendations."

Summary - Livestock members should be thoroughly knowledgeable of the disease, brucellosis and comply with state and federal

guidelines. Especially important is knowing the methods by which brucellosis is transmitted between livestock.

9. Do you believe the cattle owners understand the disease brucellosis and the regulations formulated to eradicate the disease?
If not, what can be done to educate them?

Practitioner A - "There has been an explosion of information on brucellosis within the last five years. But the cattleman still has a poor understanding of the disease. It is a complex disease and regulations change frequently. Information should continue through the media, journals, etc. The best means of educating cattlemen is through local veterinarians."

Practitioner B - "Most cattle owners don't understand the disease. The disease is so complex that it cannot be adequately explained to the majority of cattle owners. Rumors and preconceived ideas make up the bulk of the disseminated information."

Researcher A - "The cattleman doesn't understand the disease or the regulations. Private practicing veterinarians can do much to educate local ranchers, but veterinarians must receive supplemental training to become updated on latest developments and changes."

Researcher B - "The livestock industry and the practicing veterinarians need a better educational base from which to operate. If you can stimulate people to listen and learn the educational base would be greatly expanded."

TSCRA representative - "The disease is not understood by cattlemen. Some individuals do not want to know about brucellosis and others think they know all about the disease. These individuals have

predetermined ideas and will never change. Educational meetings are held by the TAHC and TSCRA, but a problem in brucellosis education is that unless you had the disease and are sincerely interested, then the repetitious discussion becomes boring and uninformative."

ICA representative - "The cattlemen do not understand brucellosis, and dislike the eradication program. They have predetermined ideas and turn a deaf ear to educational programs."

Regulatory representative A - "Livestock owners do not understand the disease the way they should. Educational efforts by the extension service and other agencies have been beneficial. Practicing veterinarians should attend seminars to ensure correct information is disseminated throughout their clientele."

Regulatory representative B - "Lack of knowledge by the herd owner is a big problem and education is an age old problem. Some people don't care to learn and others think they know all about the disease and refuse to be educated further.

Extension service and agricultural organizations should continue their efforts through local meetings, journal articles, etc.

Owners of infected herds usually have their first educational experience when the field inspector arrives to perform the herd test. Depending on the inspector's knowledge, motivation, and training ability this first contact may be a lasting impression."

Summary - Herd owners do not understand the disease, brucellosis and there is no foolproof method that will educate all herd owners. Educational meetings, news releases and verbal education by practicing veterinarians must continue. Regulatory officials should

fully explain the disease and discuss the methods used for detection and prevention.

10. Do you think brucellosis eradication is politically feasible and what impact does it have on Texas politics?

Is there sufficient legislation to enforce the eradication program?

To what extent does the federal government interact with the Texas program?

Practitioner A - "Brucellosis eradication is politically feasible.

There is not sufficient legislation to enforce the program.

The present legislature must approve the Texas program in order to follow the basic guidelines established in the federal UMR.

The federal government will interact with the state by quarantining Texas cattle if federal guidelines are not adopted. Part of the state brucellosis budget is funded by the federal government, i.e. vaccination and indemnity payments."

Practitioner B - "Brucellosis eradication is politically feasible because the majority of the population (approximately 80 percent) lives in the cities and they are not affected by the negative aspects of the program."

Researcher A - "The program is politically feasible, but the present legislature must pass the program and make it constitutional for all cattle raisers, including Red Nunley."

Researcher B - "I do not have adequate knowledge to make a statement on the political nature of the brucellosis program. The ultimate fate of the program is in the hands of the producers and

ultimately their representatives, the legislature."

TSCRA representative - "The brucellosis program is politically feasible, because 98.5% of the herds in Texas are not infected and should be in favor of the program."

ICA representative - "Brucellosis is not a political disease but a bureaucratic disease."

Regulatory representative A - "The brucellosis program is politically feasible, but not having much impact on Texas politics."

Other states have more impact on the Texas program than the federal government. If the federal government is forced to quarantine the state, it is primarily due to the pressure exerted by the other states that have complied with federal regulations."

Regulatory representative B - "With the impending state quarantine, it is premature to speculate on Texas politics."

Summary - Brucellosis eradication is politically feasible. Since the state legislature reconvened and approved the Brucellosis Eradication Program, there is now sufficient legislation to enforce the program. The federal government reviews the state eradication program for compliance and funds the vaccination and indemnity programs.

11. In general, what do you think of the Texas Brucellosis Eradication Program?

Practitioner A - "It is a good program, if administered properly. In the final stages of eradication, program expense per unit of disease will increase but the outcome will be worth the effort."

Practitioner B - "The program has provided jobs for a select few. There has been progress over the years, but the overall picture of

eradication is doubtful unless more teeth is put into enforcement."

Researcher A - "It is a scientifically sound program and will result in eradication if properly implemented with the cattle raisers support."

Researcher B - "It is an adequate program for making continued progress toward eradication, provided the cattle industry is supportive of surveillance, vaccination, and wise herd health hygiene and management."

TSCRA representative - "The present program is the best answer to an unpleasant problem. It has more support than the old program which caused the cattlemen's revolt. The new program has the following features; the new Strain 19 vaccine for adult vaccination and calf-hood vaccination, flexible herd plans, and a divided state that gives freedom of movement in Area B, West Texas."

ICA representative - "The new program is not working and there should be a change to a program that the producer will accept. It should be centered around mandatory calfhod vaccination exclusively, with freedom of movement, and no quarantine. ICA wants more research to develop a killed vaccine."

Regulatory representative A - "Now we have a program that experts say will work. It is based on scientifically correct procedures that are flexible enough to reduce the hardship on the producer. It will work if cattlemen will cooperate and let it work."

Regulatory representative B - "The TAHC guidelines have been developed according to federal standards and progress in brucellosis eradication has been made. The program should continue."

Summary - The present program will eradicate brucellosis. But, it will take time, money, and a cooperative effort between the herd owner and regulatory officials.

CHAPTER VIII

SURVEY DISCUSSION

The 25 survey questions are referenced in Appendix B and will be discussed in this chapter. The discussion will interpret the survey results depicted in Appendix C and Appendix D. Statistical calculations will not be displayed, but may be acquired from the author upon request.

1. HERD QUARANTINED

The purpose of this question was to determine if the owners of infected herds knew their herd was quarantined. If the owners didn't know their herd was under quarantine, the movement restrictions were definitely not conveyed and the spread of brucellosis was not curtailed at the basic level of plain verbal instruction. Approximately 2.5 percent said their herds were not quarantined and less than .3 percent were unsure. However, all respondents answering no, not sure or no response answered question 7, which indicated they had infected herds and should have been quarantined.

The county where the herd owner or herd is located was requested to get a distribution pattern within the state. The responses were evenly distributed.

Summary - Adequate instruction on herd movement and brucellosis transmission was not given to 2.8 percent of the herd owners. There was no statistical difference between Area C and Area B responses.

2. MEETINGS IN YOUR AREA

This question relates to where educational meetings were held throughout the state and, primarily, if knowledge of such meetings

is being effectively disseminated to the rancher/farmer.

Although the Texas Agriculture Extension Service and other organizations hold meetings which frequently include brucellosis training, the county of residence in the questionnaire was correlated to the counties where the accelerated program and educational meetings were held.

Forty-Seven percent of the herd owners in the accelerated areas were aware of meetings. Since there may or may not have been meetings outside the accelerated area, the only conclusion to be derived from the other responses is that 30-40 percent were aware of brucellosis educational meetings.

Summary - There was no statistical difference in responses from Area C and Area B which indicates there are meetings held throughout the state and the accelerated educational program did not have enough impact to make the difference significant. Although the results from Area B and Area C were not statistically significant, the weakest link in the brucellosis program is informed herd owners. Every effort should be made to notify herd owners of area meetings.

3. REASONS FOR NOT ATTENDING MEETING

This question tries to reveal some of the reasons why herd owners did not attend educational meetings. The herd owners who indicated they attended the meeting, and those who did not respond were considered to have attended the meeting, and were listed as no response. Eighty-nine percent of the herd owners attended the meeting in Area C, and 91 percent in Area B attended the meeting. Time Conflict (24% ave.) and no meeting (39% ave.) were the major responses.

Time conflict may be a catch all reason, but meetings in accelerated program areas were held at 1:00 p.m. according to the TAHC report. This is a very busy time of day for most fulltime and/or city employed farmer/ranchers. Evening meetings would seem more appropriate, especially in view of the amount of time conflict responses. The number of individuals who responded not concerned was relatively low (less than 7 percent in Area C and B), but it is surprising to know people are not concerned about this controversial disease.

Summary - Ninety percent of the herd owners who were aware of the meetings attended them. Area educational meetings should continue.

There were no statistical difference in the responses between Area C and Area B.

4. UNDERSTAND BRUCELLOSIS REGULATIONS

This question tries to determine whether owners of infected herds were informed of the regulations to the herd owner's satisfaction, or whether they were unsure about the regulations that affect their herd and their life tremendously while under quarantine. Over 70 percent thought they understood the brucellosis regulations in both Area B and Area C. Approximately 70 percent of the respondents in Teague (1978) indicated they were informed of the regulation. When the not sure sure response was included with the no response approximately 25 percent of the surveyed population indicated more education was needed in this area.

Summary - There is no statistical difference in the responses between Area C and Area B. There is no statistical difference in the

1977 and 1982 survey which indicates educating herd owners about brucellosis regulations has not improved since 1977. Herd quarantine affects the livelihood of the herd owner and the applicable regulations should be fully explained.

5. NEIGHBOR'S HERD TESTED

Testing of neighbor's herds was a program element that was suggested by the NBTC, mentioned by persons interviewed, and documented by the TAHC report as the primary means of detecting the source and extent of brucellosis infection.

Approximately 30 percent of the neighboring herds in Area C and Area B were known to be tested. Twenty to 25 percent were not sure, so it is possible other herds were tested. The most important fact remains that approximately 47 percent of neighboring herds were not tested.

Testing neighboring herds is costly, time consuming, and takes a very cooperative herd owner to allow regulatory officials to test his cattle when they haven't evidenced brucellosis symptoms. The TAHC may have been reluctant to pursue this procedure because of the legal uncertainty that has plagued the program recently.

Summary - The brucellosis program is now constitutional and testing of neighboring herds should be increased to comply with the NBTC recommendations. There is no statistical difference in the responses from Area C and Area B.

6. HERD MANAGEMENT EVALUATED

The question tests another important program element repeatedly stipulated as a major part of the brucellosis program. In this

questionnaire the majority of respondents (64% Area C, 70% Area B) indicated their herd management practices were evaluated. Twenty to 30 percent said no and 5 to 10 percent were unsure.

Summary - The majority of herd owners had their herd health program evaluated. Since approximately 35 percent of the herd programs were not evaluated, improvement is needed in this area. There is no statistical difference in Area C and Area B.

7. NUMBER OF TIMES HERD TESTED

Table 9 lists the number of times a given herd under quarantine has been tested. The responses show that a preponderance of herds fall between two and eight times tested for Area C, and three to six times tested for Area B. It is interesting to note that twenty-three individuals could not begin to guess at the number of times their herd was tested. Another individual stated his herd was tested seventy-five times.

Summary - Eradicating brucellosis from a herd may be a lengthy, expensive process. Testing procedures have numbered up to 75 times. With this testing frequency it is no wonder that many herd owners hold great animosity toward the brucellosis program.

8. DID PERSON TESTING YOUR HERD EXPLAIN THE QUARANTINE PROCEDURE

Again, this question tests the educational and public relations aspects of the brucellosis program. Eighty-five percent of the people in Area B and C indicated they were informed and approximately 14 percent of the respondents indicated they were not informed or did not understand the quarantine procedure.

This question was compared to the Teague (1978) questionnaire. His responses resulted in the exact same percentage figures, indicating the program has not progressed in educating the herd owners about quarantine and eradication procedures.

Summary - A very high percentage of the herd owners were informed of the quarantine procedures, but the statistical evaluation indicated there was no significant improvement in educating herd owners in 1977 vs 1982. To control herd movement, all herd owners must be informed of quarantine procedures. There was no statistical difference in Area C and Area B responses.

9. WILL PRESENT PROGRAM ERADICATE BRUCELLOSIS

This particular question stimulated the most written responses and adamant replies against the program. Also, many indicated the program would control the disease but would not eradicate it. Individuals cited dishonest cattle traders, veterinarians, sale barn operators, and the lack of regulatory enforcement as reasons for not eradicating the disease.

Approximately 55 percent of the respondents in Area B and C gave a negative reply to brucellosis eradication. In Teague (1978), 63 percent responded negatively. Respondents answered yes and not sure 20 to 24 percent for each question in Area B and C. In 1977, 17.6 percent responded yes.

Summary - There is a slight trend in favor of the brucellosis program in 1982 as opposed to 1977. Statistically the responses revealed no difference between Area C and Area B or between the 1977 and 1982 questionnaire. Although, the difference between the 1977

and 1982 questionnaire was very close to being significant. The p value was between .05 and .10.

Since 75 percent of the responses were unsure or didn't believe the program would eradicate the disease, a great deal of public relations work and education is needed to reverse the overwhelming negative public opinion.

10. BRUCELLOSIS CONTAGIOUS TO PEOPLE

This question revealed most respondents knew the disease was contagious to people of all ages (84% Area B, 87% Area C). This is comparable to Teague's responses in 1977 (86% aware). Once again, the responses were distributed similarly in all questionnaires.

Summary - Every cattle owner with a quarantine herd should be aware of the possibility of human infection. Fifteen percent were not informed. More education is needed in this area. There was no significant difference between Area C and Area B responses or between the 1977 and 1982 questionnaires.

11. WILL YOU PRACTICE CALFHOOD VACCINATION

Since the vaccination program is very essential to eradicating brucellosis, this question was asked to see how many individuals will calfhood vaccinate. An overwhelming number of 90.8 percent in Area C indicated that they would vaccinate. Area B had a 10 percent variation, but 81 percent responded favorably to calfhood vaccinating in the future. The NBTC, and other research literature, as well as the TAHC objectives specify at least 70 percent calfhood vaccination is essential to control the spread of brucellosis and to promote disease eradication.

Summary - The TAHC objective is to get a 70 percent calfhood vaccination rate. More than 70 percent of herd owners who had brucellosis in their herd indicated they will calfhood vaccinate in the future.

There was a significant difference in the responses from Area C and Area B. Herd owners in Area B were more reluctant to vaccinate

than Area C herd owners.

12. BRUCELLOSIS INFECTION IN SWINE, GOAT, SHEEP AND HORSES

It is surprising to note that over 50 percent of the respondent population in Area B and C were aware brucellosis can infect other animals. Many respondents named other animals not mentioned in the question, such as bison, deer and coyotes. These animals are not considered a threat, and were not included for that reason. In fact, brucellosis from dogs is fairly specific and is the least likely to be a threat to the cattle industry. Of all the animals mentioned, a horse with fistulous withers or poll evil frequently sheds B. abortus and is probably the greatest threat in a herd besides the infected cattle themselves. B. melitensis and B. suis can be transmitted to cattle but B. melitensis has not been reported in Texas livestock.

Summary - Statistical analysis of Area B and C, and the 1977 and 1982 questionnaires indicate there is no significant difference in responses to this question.

13. INDEMNITY PROGRAM

The majority of responses to this question did not think the indemnity paid for reactor cattle was sufficient to cover losses due to the brucellosis infection. In fact, Area B exceeded Area C by 16 percent with this negative response. Area C had 27.3 percent in favor of the present indemnity.

The answer not informed of indemnity was included to see if everyone is informed of indemnity. Only two individuals were not informed and evidently not paid indemnity.

Many comments and postscripts were received with this question.

Examples include questions concerning indemnity payments which were six months overdue and statements that the government should not be paying someone for their herd management mistakes.

Summary - Statistically, there was no significant difference between the responses in Area C and Area B. However, the p value was between .10 and .05 and was close to being significantly different.

Because of the many comments made about the indemnity program, it is felt the program in itself is very controversial and does little to support the overall brucellosis program.

14. APPLY BRUCELLOSIS LAW TO SHEEP AND SWINE

This question shows that 55.8 percent of the respondents in Area C and 40.6 percent in Area B think the program should apply to sheep and swine. The no response in Area B is approximately twice as great as Area C. The negative attitude in Area B (West Texas) could stem from the fact that there are more sheep raised in West Texas and some respondents may be adverse to another program that may have the same impact on the sheep industry as it is having in the cattle industry. There is not a great brucellosis problem in the swine and sheep industry in Texas.

Summary - Although there were more negative responses in Area B than Area C, the overall result in these two areas indicated there was no significant difference in Area B and Area C responses.

Extending the program to other species was not strongly favored. This again depicts the need for public relation work to promote the brucellosis program.

15. DID YOU CALFHOOD VACCINATE

The purpose of this question was to determine what percent of the herd owners practiced calfhood vaccination. Although 63.5 percent of the cattle owners in Area C calfhood vaccinated, they still acquired the disease in their herd. Fifty-one percent vaccinated in Area B. Another question to ask these individuals would be how many reactors were calfhood vaccinated, and was it with the old Strain 19 or the new Strain 19. Since 5.7 percent in Area C and 2.7 percent in Area B indicated they vaccinate sometimes could account for some herds not being properly protected. Other conditions and transactions could have occurred to promote infected herds, such as introducing diseased animals that were detected later.

Summary - There was no significant difference in the responses from Area C and Area B. But, there is a significant difference in the responses to the 1977 and 1982 questionnaires. The majority of respondents in 1977 did not vaccinate, whereas the majority of respondents in 1982 did vaccinate. This shows a desirable and marked improvement over the years in a very important program element.

16. AGE CALVES ARE VACCINATED

This question attempts to reinforce question 15 on the number of herd owners who do not vaccinate and at what age are calves being vaccinated. Both Area A and C were within 2 percent of verifying the fact they do not vaccinate. This is possibly due to misinterpretation of the question or a recording error. The majority of respondents in Area C vaccinated in the 5-6 and 7-8 month age groups.

An overwhelming majority of respondents in Area B vaccinated at 5-6 months. Although the regulation stipulates vaccination at 4-12 months with the new Strain 19, the 5-8 month span is very good to prevent titers carrying over into adult cattle. The new vaccine should not overwhelm the young animal's immune system as the old Strain 19, but 3 months is actually too young to vaccinate.

Summary - Although the majority of herd owners vaccinated their calves at the proper age, there was a statistically significant difference in the age groups vaccinated in Area C and Area B, as well as in 1977 and 1982. The allowable vaccination range, makes this statistical results inconsequential.

17. REDUCE DOSAGE STRAIN 19

This question depicts the extent of education received by the herd owner on the new Strain 19 vaccine. Area B and C had remarkably similar results. Approximately 55 percent indicated they were informed of the vaccine and approximately 40 percent were not informed or did not understand what was explained. Although question 11 indicated 80-90 percent of the herd owners would vaccinate, a greater effort should be made to instruct all herd owners on why the new vaccine should be used and what are its benefits.

Summary - More emphasis on educating herd owners about the use of the new Strain 19 vaccine is needed. Only 55 percent were knowledgeable of the vaccine. There was no significant difference in Area C and Area B.

18. LABORATORY METHODS EXPLAINED

The new laboratory system was another program element. To educate the herd owner on various methods used to correctly identify infected cattle would help gain the confidence of the herd owner.

The responses for Area C and B were 40-50 percent yes and approximately 40 percent no. Six to 8 percent didn't understand what was explained. This could be added to the yes response showing that the explanation was attempted. The fact that over 40 percent of the responses were negative, indicates this program element is not routinely included as an educational topic.

Summary - Laboratory methods should be included as part of the routine educational procedure. The old testing procedures were unreliable and this stigma has remained steadfast in the minds of the herd owners. Explaining the new laboratory methods is a must to gain the cattle industries confidence. There was no statistical difference in the Area C and Area B questionnaire results.

19. BRUCELLOSIS TRANSMISSION EXPLAINED

This question addresses a very basic element for preventing brucellosis infection in man and animal. That is identifying the methods of transmission, so that steps can be taken to prevent the disease. This is another educational topic that should be discussed with owners of infected herds. It should be part of the herd management evaluation.

In Area C, 27 percent, and in Area B, 21.6 percent, responded negatively to this question. Six to 8 percent in each area didn't understand what was explained. These figures were closely associated

(within 3 percent) with the negative responses to question 6, Herd Management Evaluation. If herd management practices were not evaluated, then the methods of reinfesting the herd, or the owner was not likely addressed. Testing officials should be instructed to educate herd owners on all methods of brucellosis transmission.

Summary - There was no statistical difference in the questionnaire from Area B to Area C but the p value fell between .10 and .05.

More emphasis should be placed on educating the herd owner on how to protect himself and his herd from brucellosis.

20. IS A COW THAT ABORTS SOLD, KEPT OR TESTED

The response to this question shows the majority of herd owners in Area C sell cows that abort, and the majority in Area B test cattle. It should be noted that many responses in both areas indicated they would test and then sell if the cow had brucellosis and keep the cows if tested negative. Such responses were listed under test and are the correct procedure.

Approximately 49 percent in Area C and 30 percent in Area B sell cattle that abort. Many times they are sold to cattle traders or other individuals who circumvent identification procedures by selling under fictitious names or who sell to weekend farmers and ranchers who are looking for one or two cows for their 5-acre ranchette. And so the disease is propagated.

Summary - Herd owners should be instructed to test cattle that abort, identify the cause, and do what is necessary to prevent spreading any disease conditions that may exist. Instructing herd owners to test cattle that abort should be included in the education

program.

There was no significant difference in the questionnaire answers from Area B and C.

21. IF YOU DRINK RAW MILK IS COW TESTED

The overwhelming response to this question was, does not apply (84% in Area C and 78.4% in Area B). This is expected because of the convenience and widespread accessibility to pasteurized carton milk purchased from stores. Individuals purchasing milk from neighbors or other sources of raw milk would respond not sure, unless they were aware when the cows were tested. Over 2 percent responded not sure in Area B and C. There were more persons drinking raw milk from untested cattle in Area C (4.9%) than Area B (2.7%). As discussed in question 19, this response indicates that regulatory officials should include educating all herd owners of the different methods of acquiring human brucellosis, especially drinking or eating raw dairy products. Testing milk cows annually helps to safeguard human exposure in the event of unknown exposure.

Summary - A very small percentage of herd owners drank or ate raw dairy products from untested cows. Nevertheless, instructing herd owners to test their milk cows annually should be part of the educational program.

More respondents in 1982 did not drink raw milk as opposed to respondents in 1977. There was a significant difference in the 1977 and 1982 responses. But there was no significant difference between Area B and Area C responses for this question.

22. COMPULSORY CALFHOOD VACCINATION FOR BRUCELLOSIS

This question is twofold. 1) Do the respondents favor a compulsory calfhood vaccination program paid by the state and federal government. This was answered by yes or no. An overwhelming majority in Area C of 82.2 percent said yes. Six percent said no. In Area B, 70.3 percent said yes and 10.8 percent said no. 2) The responses against compulsory vaccination and against any vaccination were an effort to see if herd owners are against any vaccination or only mandatory vaccination. The responses were less dramatic but Area B, again held the majority with 13.5 percent against compulsory vaccination and 2.7 percent against vaccination. Area C had approximately half the percentage for both responses as Area B.

A frequent comment noted on the questionnaires with negative responses to the vaccination program was that they did not want government involvement in any program. The less government intervention, the better, was the overall viewpoint. A few responses indicated that they would pay for their own vaccinations rather than have another costly government program. However, the government is paying for the vaccine now and 81 percent of the cattle owners responded in favor of the program.

Summary - A large majority of cattle owners were for compulsory vaccination paid for by the government. There was no significant difference in the questionnaire responses from Area C and Area B.

23. RETEST PURCHASED CATTLE 45-120 DAYS

This question was asked to determine if infected herd owners were informed of retesting purchased or new herd additions 45-120

days after acquisition. Due to latent infections, long incubation periods, and other conditions that occasionally give false negative test results, it is essential that cattle owners retest new herd additions within the time limits stipulated. Many herd owners that responded negatively made comments to the effect that they were not informed of this suggested retest period and were appreciative of this new information. Area C had a negative response rate of 45.7 percent. Area B had 37.8 percent respond no, but had a response rate of 40.6 percent of herd owners who did retest their cattle. The answer sometimes was basically identical for Area B and C. A response that was not an answer, but is listed separately because of written comments, was that cattle were not purchased. Replacement heifers came from within their existing herd. Over 10 percent responded in this manner in Area C and 5.4 percent in Area B.

Summary - Retesting new herd additions is a very important procedure in preventing brucellosis in a herd. The survey indicated herd owners were not made aware of this procedure in approximately 40 percent of the responses. This procedure should be explained to all herd owners in any educational meeting.

There was no statistically significant difference in responses from Area C or Area B.

24. ARE YOU SATISFIED WITH MCI AND BRT

The responses for Area B and C were practically the same. Approximately 63 percent responded yes in Area C and B. Twenty-four percent responded negatively to the programs, and 7-8 percent preferred a different method.

In this question herd owners were encouraged to list the surveillance method they preferred. Area B and C suggestions were combined.

Many cattle owners believed the current testing procedures and the program were not reliable. They had cows that had never aborted, were sold, reacted, and were traced back to their herd. Herd owners complained about vaccinated cattle that 'banged out'. One individual toured the Austin Lab and wasn't satisfied with the control used to identify samples. A great majority requested mandatory vaccination of all heifers, either at origin or at sale barns, and test all cattle at all sale barns. Many comments were made regarding vaccinating all cattle that come through the sale barn, and to eliminate test and quarantine procedures. In discussing vaccination, herd owners voiced a strong desire for a killed vaccine that they could use themselves.

Individuals did not think the slaughter house bleeding procedures had adequate controls and would prefer testing all cattle at the sale barn, rather than at the slaughter facility.

A few herd owners had experienced or witnessed sale barn operators and cattle traders getting away with improper buying and selling practices, and voiced a need for tighter controls on these operations and operators.

Summary - The majority of herd owners in both Area B and C were satisfied with the MCI and BRT. There was no statistical difference in responses from Area C and Area B. When this question was compared to Teague (1978), there was a large difference in every

category. There was a statistically significant difference in the 1977 and 1982 responses.

25. ADULT VACCINATION WITH STRAIN 19

This question is again testing the education process to determine if the vaccination program for adult cattle was discussed with owners of infected herds. An additional response category was listed because of frequent comments regarding initiating adult vaccination. Adult vaccination is only recommended in problem herds where eradication is difficult.

By combining yes and have vaccinated, 60 percent are in favor of adult vaccination in Area C and 50 percent in Area B. Once again Area B had the largest negative response with 13.5 percent as opposed to 11.2 percent in Area C. Thirteen percent of Area B didn't understand what was explained indicating a lack of proper explanation. This answer accounted for the second highest response in Area C.

Summary - The responses to this question clearly indicate more education and explanation is required to develop the herd owner's confidence for adult vaccination with Strain 19. Many negative comments were made by individuals who vaccinated their adult cattle. The adverse response to the vaccine may have been normal for a heavily infected herd but this should have been explained to the owner. There was no significant difference in the responses from Area B and Area C.

CHAPTER IX

SUMMARY AND CONCLUSIONS

In general, there was no difference in the way the Texas Brucellosis Program is administered in Area C or Area B. Since both areas are regulated by the same guidelines, this is expected. There was also no difference in the 1977 and 1982 surveys. A difference that shows improvement was expected. The following areas have been identified as needing improvement.

Most of the questions in the survey indicate a much better job of educating herd owners should be performed by regulatory officials who test and quarantine infected herds. Education and explanation is needed in herd health evaluation; methods of brucellosis transmission to man and animals; retesting purchased cattle; when, why, and how the new Strain 19 vaccine is used; what to do when a cow aborts; applicable regulations and quarantine procedures; and the laboratory methods used to detect brucellosis. Education through the media, practicing veterinarians and area meetings must continue to keep herd owners informed of changes and to reiterate disease prevention techniques.

A program objective that should be pursued according to stipulated guidelines is testing herds that adjoin infected herds. Only in this manner can reservoir herds that harbor the disease be located.

The calftooth vaccination program is supported by owners who had infected herds. Vaccination coupled with detection and elimination is the key to eradicating brucellosis.

A majority of herd owners surveyed did not think the indemnity payments were sufficient. The comments made on the questionnaires indicate it is also a source of controversy. Most of the persons interviewed were against the indemnity program. The money from the program should be used for research.

Additional research for a better and more stable vaccine was supported by all agency representatives.

When owners with infected herds are initially contacted by regulatory personnel, the officials should be prepared to explain the disease and all aspects of the program. A checklist, with supporting literature, should be followed during the instruction and left with the owner for his perusal.

The questionnaire survey has revealed much useful information and allowed many herd owners a chance to voice their opinion. The interviews were generally very informative and the interviewing experience was educational. Some interviews were candid responses from the regulation while others were personal ideas and experiences which contributed to this report.

A third questionnaire is recommended in four or five years to determine if herd owner education has improved. Interviews in conjunction with the questionnaire are not recommended. It is too costly and time consuming to prepare questionnaires and perform interviews for the same research project.

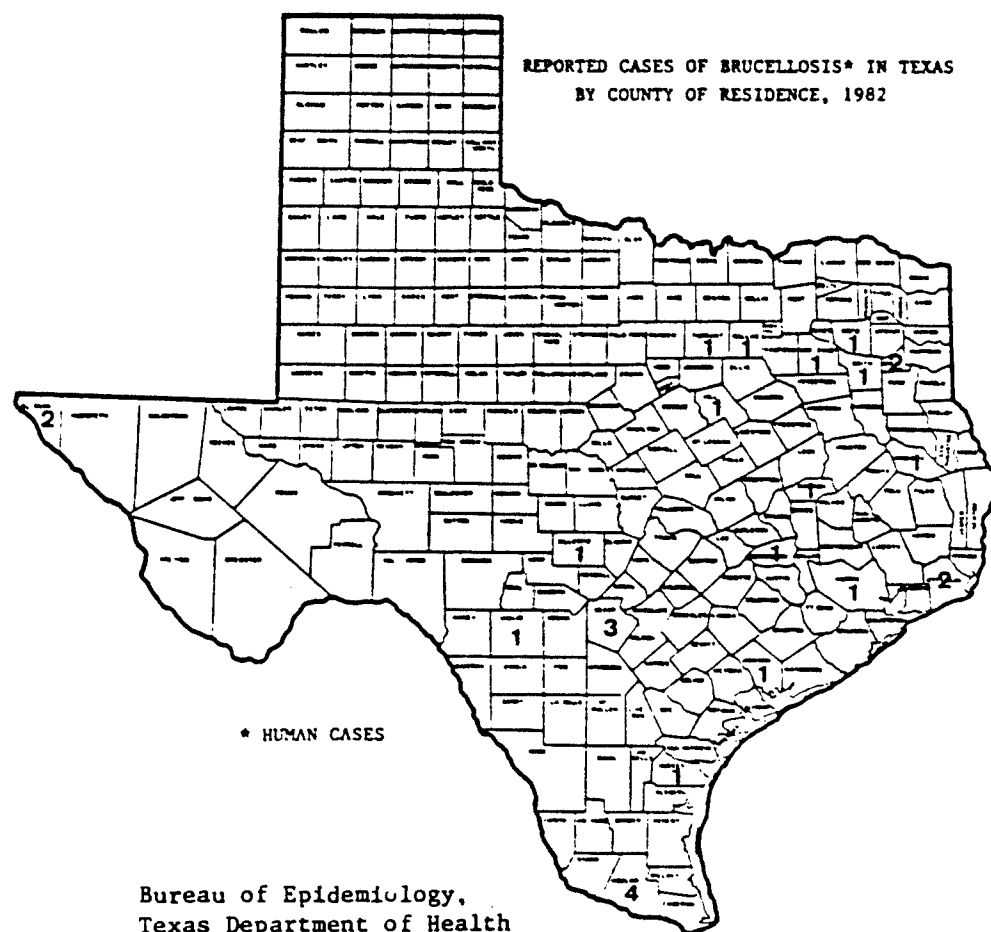


FIGURE 1

TEXAS BRUCELLOSIS PROGRAM

State Fiscal Year, 1982

Accumulative Infected Herds - Total of all herds that had a laboratory confirmed reactor during fiscal year 1982, even though many have been released from quarantine prior to August 31, 1982.

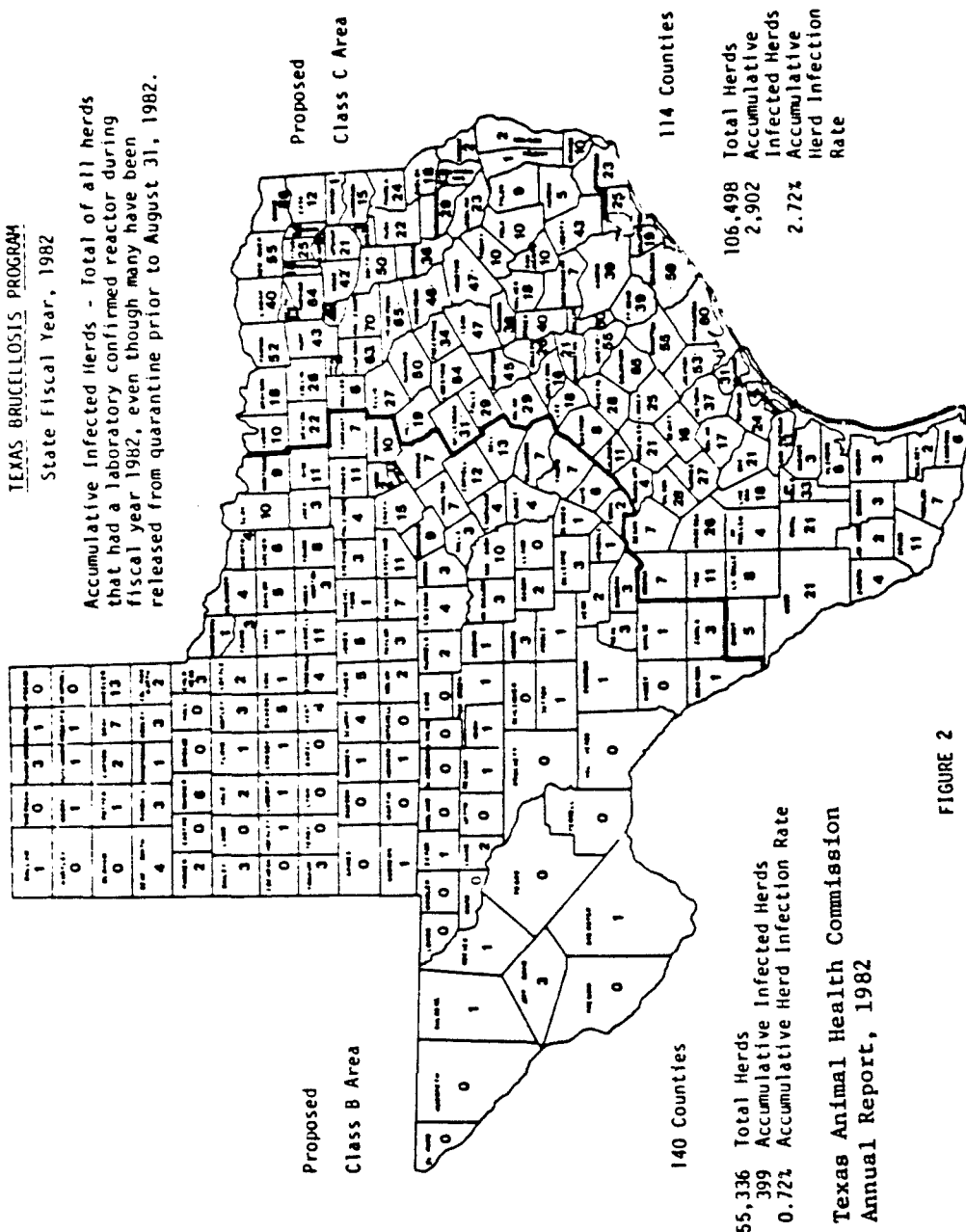


FIGURE 2

TEXAS BRUCELLOSIS PROGRAM

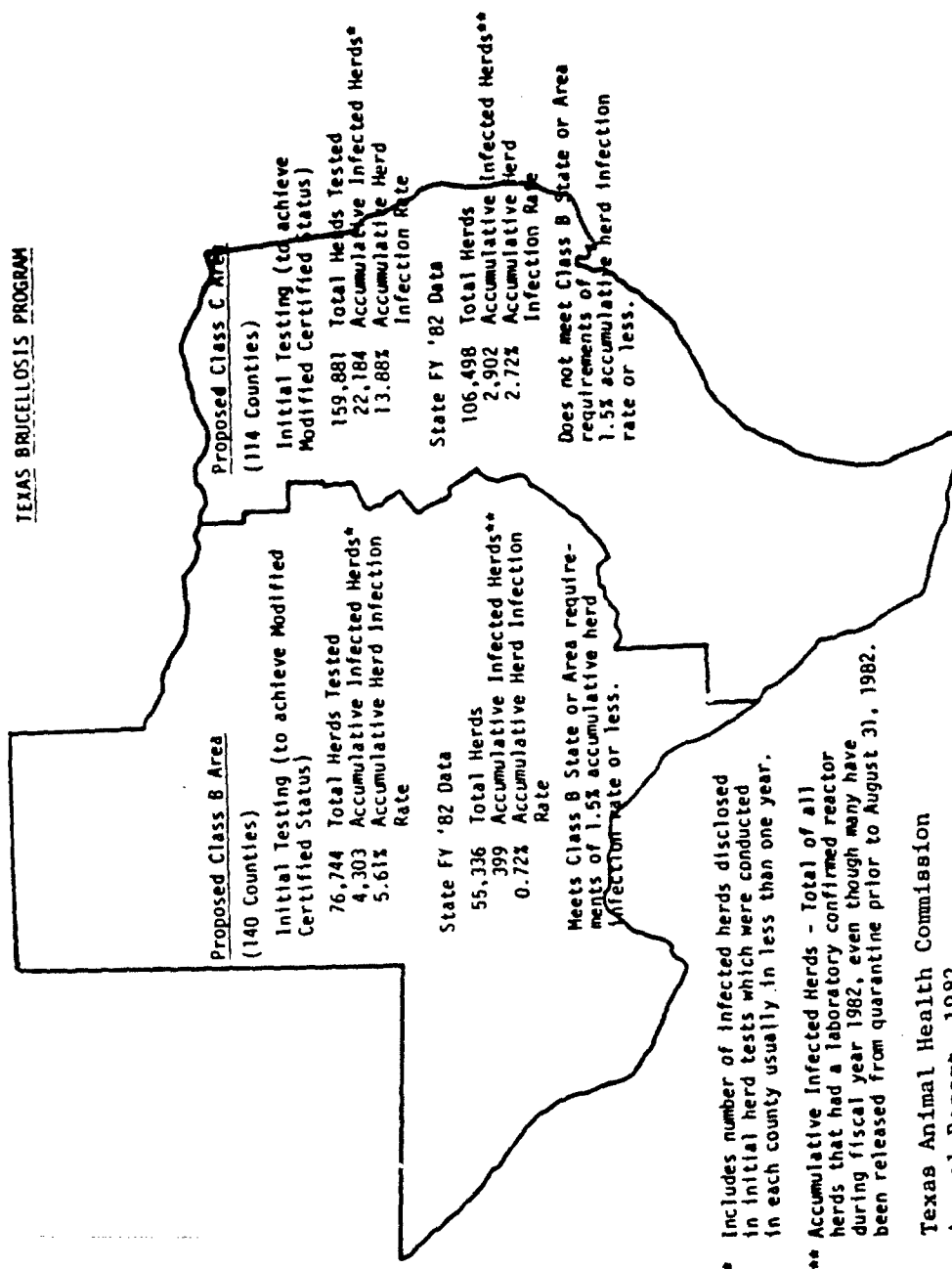


FIGURE 3

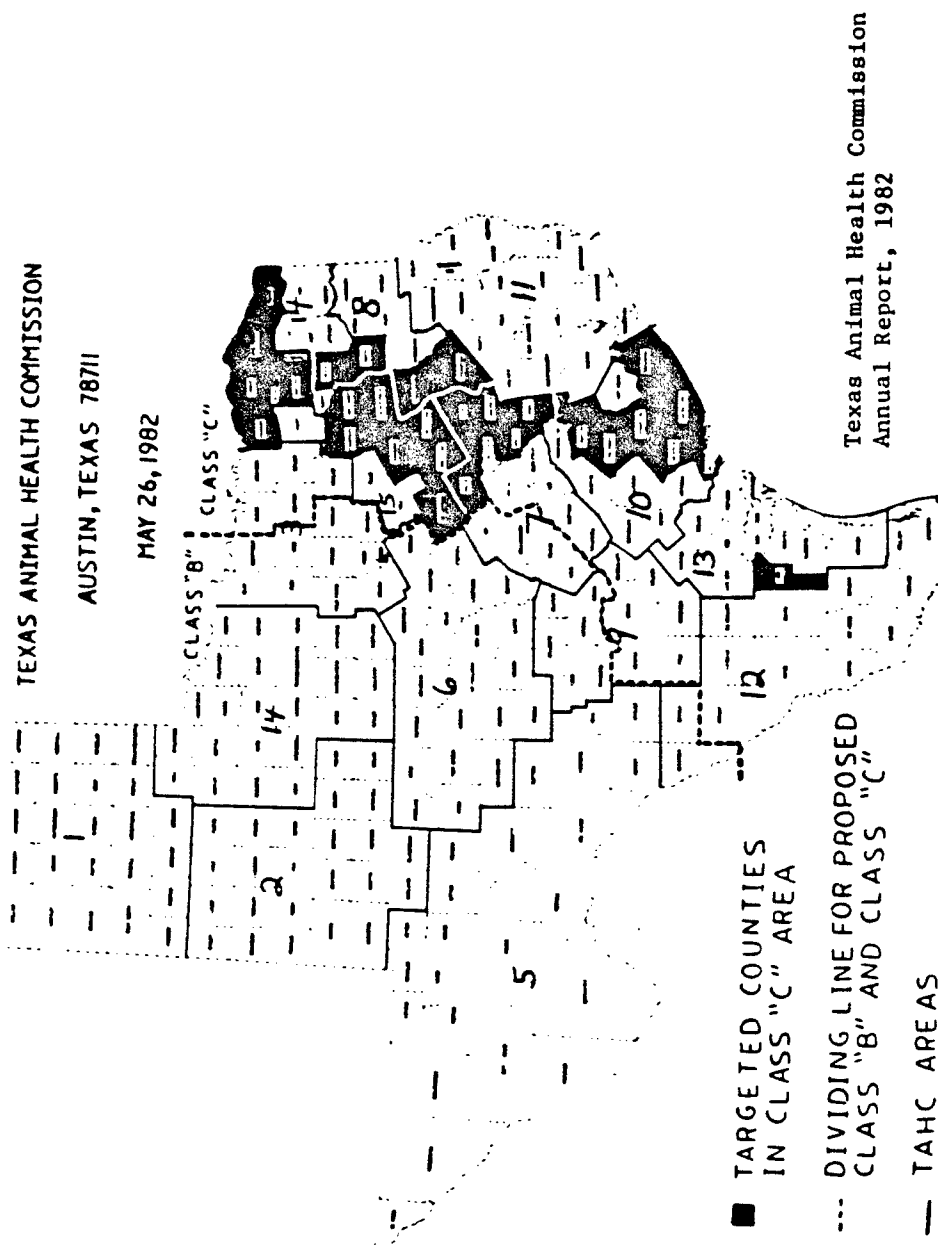


FIGURE 4

Accumulative Vaccinations Per Fiscal Year

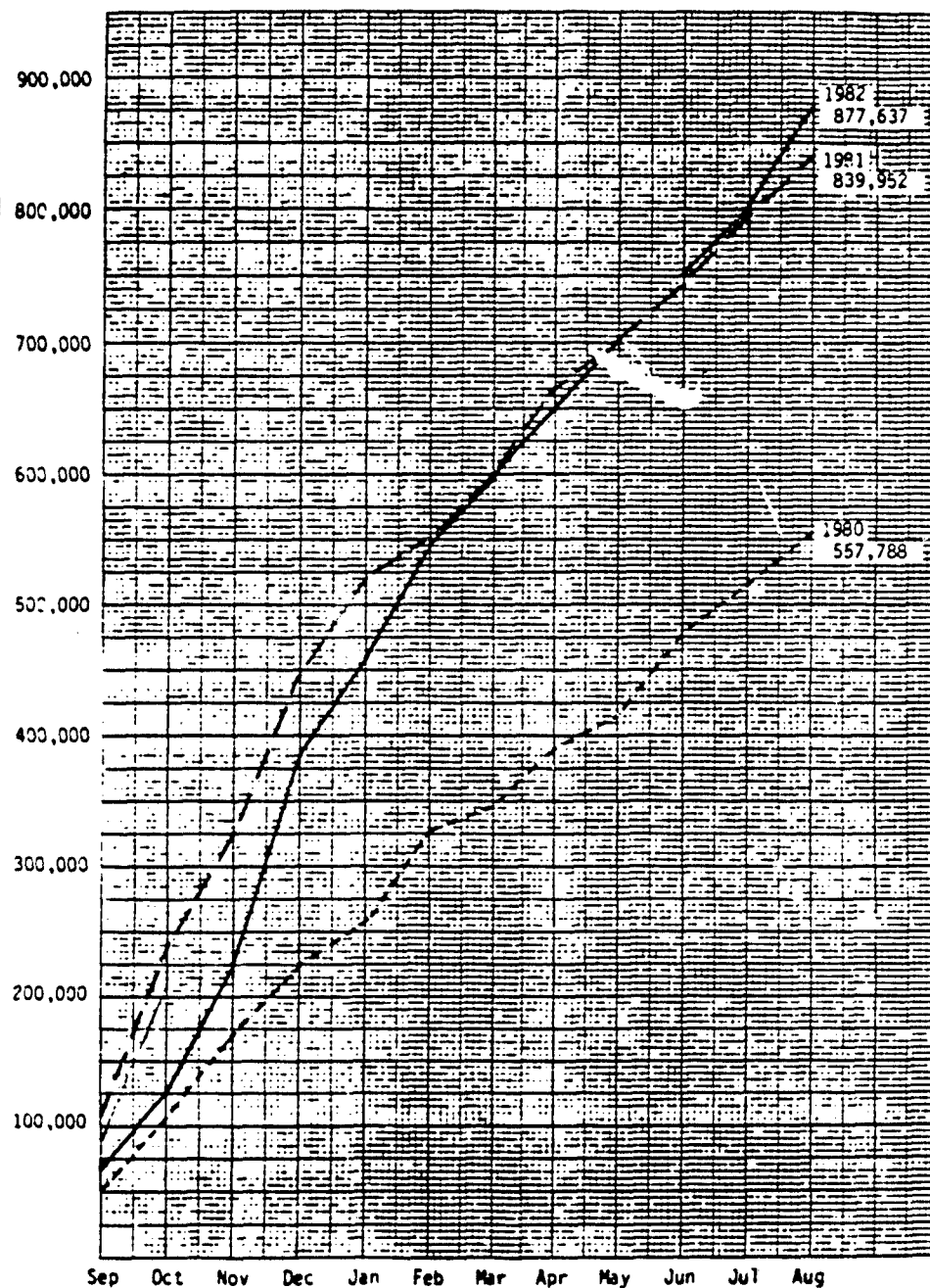


FIGURE 5

Texas Animal Health Commission
Annual Report, 1982

APPENDIX A
INTERVIEW PACKET

THE UNIVERSITY OF TEXAS
HEALTH SCIENCE CENTER AT HOUSTON
School of Public Health

MPH PROGRAM AT SAN ANTONIO

OFFICE OF THE ASSOCIATE DEAN
512 691-4946

7708 Floyd Curl Drive
San Antonio, Texas 78284

I am a student attending The University of Texas Health Science Center in San Antonio, Texas. In order to fulfill the requirements for a Master's degree in Public Health, I am doing a research paper on the brucellosis problem in Texas. This letter will explain my project and requests your consent for an interview to discuss the questions listed in Attachment 1. If you agree to an interview, please sign the consent form (Attch. 2) which also indicates you have read and possess this consent letter. Please return the completed consent form in the self-addressed, stamped envelope provided. I will call and make an appointment at a later date.

As a veterinarian, I have worked with brucellosis in Texas, and am very interested in the disease. The eradication program has been controversial for many years. I feel that it will take a combined effort of all organizations and individuals concerned with the disease before eradication can become a reality.

My plan is to interview key members from the animal industry, veterinary medical profession, and regulatory officials. A questionnaire will be submitted to a random number of cattle owners who have experienced brucellosis in their herd. The information derived from the study will be used to evaluate the past and present Brucellosis Eradication Program.

If there are any questions in regard to this project, please feel free to call me. My phone number and address is listed above. Likewise, if you consent to an interview, and later wish to discontinue participation you are free to do so at any time without prejudice. Names of individuals interviewed will remain anonymous, if the individual so desires. Reference will only be

made to the types of organizations the individuals represent, such as regulatory, animal industry, or veterinary groups. This research study has been reviewed by the Committee for the Protection of Human Subjects for the University of Texas Health Science Center, Houston, Texas (713) 792-5048.

Thank you for your cooperation.

Sincerely,

E.D. Jemelka, DVM

Enclosures:

- Attch. 1 - Interview Topics
- Attch. 2 - Consent Form

INTERVIEW TOPICS

1. What benefits do you think can be derived from brucellosis eradication?
2. Do you think brucellosis eradication is biologically feasible? Consider the following scientific tools and programs: Strain 19 reduced dosage calfhood vaccination and adult vaccination, card test, rivanol test, complement fixation test, serotyping, test and slaughter program, and the market cattle identification (MCI) program.
3. Do you think the present brucellosis eradication program should continue and do you think it will eradicate brucellosis?
4. Why do you think the past brucellosis eradication program (prior to 1980) failed to eradicate brucellosis?
5. Do you agree with the present indemnity payment for reactor cattle (\$50 - grade cattle, \$250 - registered and dairy cattle)?
6. Do you recommend any changes in the present brucellosis program?
7. What factors do you believe are responsible for the spread of brucellosis?
8. In your opinion, what can the livestock industry do to help eradicate brucellosis?
9. Do you believe the cattle owners understand the disease brucellosis and the regulations formulated to eradicate the disease? If not, what can be done to educate them?
10. Do you think brucellosis eradication is politically feasible and what impact does it have on Texas politics? Is there sufficient legislation to enforce the eradication program? To what extent does the federal government interact with the Texas program?
11. In general, what do you think of the Texas Brucellosis Eradication Program?

CONSENT FORM

☐

I possess the informed consent letter and hereby give E.D. Jemelka, DVM, permission for an interview on the Brucellosis Eradication Program in Texas.

☐

I possess the informed consent letter and DO NOT give E.D. Jemelka, DVM, permission for an interview on the Brucellosis Eradication Problem in Texas.

Signature _____

Date _____

APPENDIX B
QUESTIONNAIRE PACKET

THE UNIVERSITY OF TEXAS
HEALTH SCIENCE CENTER AT HOUSTON
School of Public Health

MPH PROGRAM AT SAN ANTONIO

OFFICE OF THE ASSOCIATE DEAN
512 591-4846

April 11, 1983

7708 Floyd Curl Drive
San Antonio, Texas 78294

Dear Sir:

I am a veterinarian and a student preparing a Master's Thesis on the brucellosis eradication problem in Texas. The project includes a survey of livestock owners who have had previous experience with brucellosis and the Texas regulations governing the eradication of the disease. My objective is to compile the responses from livestock owners so that the present Brucellosis Eradication Program can be evaluated by its results in the field, where the problem exists.

Please complete the attached questionnaire and return it in the self-addressed stamped envelope within five weeks. Do not write your name on the reply. Confidentiality will be maintained throughout this project. Your participation is optional, but immediate attention in completing the questionnaire will let your experience with brucellosis be known and possibly let the Texas Animal Health Commission know the effectiveness of the revised brucellosis regulations.

If there are any questions in regard to this project, please feel free to contact me. This research study has been reviewed by the Committee for the Protection of Human Subjects for The University of Texas Health Science Center, Houston, Texas (713) 792-5048.

Thank you in advance for completing and returning the questionnaire promptly.

Sincerely,

E. D. Jemelka

E. D. Jemelka, DVM

BRUCELLOSIS QUESTIONNAIRE
FOR
LIVESTOCK PRODUCERS AND DAIRYMEN

County where you live _____

Please respond by placing the number of your answer in the space provided.

- _____ 1. Has your herd ever been under brucellosis quarantine?
1. Yes 2. No 3. Not Sure
If so, state county herd was located _____
- _____ 2. Were brucellosis educational meetings held in your area?
1. Yes 2. No 3. Not Sure
- _____ 3. If you did not attend this meeting what were the reasons?
1. Distance 3. Not Concerned
2. Time Conflict 4. No Meeting
- _____ 4. Do you understand the present regulations covering brucellosis in Texas?
1. Yes 2. No 3. Not Sure
- _____ 5. If you had brucellosis in your herd, were your neighbors' herds tested?
1. Yes 2. No 3. Not Sure
- _____ 6. Were your herd management practices evaluated and a herd health program developed to prevent the spread of brucellosis?
1. Yes 2. No 3. Not Sure
- _____ 7. If you had brucellosis in your herd, please enter number of times the herd was tested.
- _____ 8. If you were under a brucellosis quarantine, did the person testing your cattle explain what was taking place and what was being done to clean up the herd?
1. Yes 2. No 3. Did not understand what was explained
- _____ 9. In your opinion do you feel that the present approach to the eradication of brucellosis will be successful?
1. Yes 2. No 3. Not Sure

- _____ 10. Do you know that brucellosis is contagious to people of all -
ages?
1. Yes 2. No
- _____ 11. Have you begun or will you begin calfhood vaccination of all
replacement heifers?
1. Yes 2. No 3. Not Sure
- _____ 12. Were you aware that brucellosis could also infect swine, goats,
sheep, dogs and horses?
1. Yes 2. No 3. Only aware of few animals
listed
- _____ 13. Do you feel that the present indemnity program of \$50 for grade
beef cow reactors and \$250 for registered beef and dairy cow
reactors is sufficient to cover your loss to brucellosis infection
in your herd?
1. Yes 2. No 3. Was not informed of indemnity
- _____ 14. Do you feel the same brucellosis law should apply to swine and
sheep?
1. Yes 2. No 3. Not Sure
- _____ 15. Did you practice calfhood vaccination for brucellosis in your
female calves?
1. Yes 2. No 3. Sometimes
- _____ 16. At what age did you vaccinate most of your calves for brucellosis?
1. 3-4 mon 3. 7-8 mon 5. Do not vaccinate
2. 5-6 mon 4. 8 mon or over
- _____ 17. Has the reduced dose strain 19 brucellosis vaccine been explained
to you?
1. Yes 2. No 3. Explained, but did not
understand
- _____ 18. Were the laboratory methods of diagnosing brucellosis in aborting
cattle explained to you?
1. Yes 2. No 3. Explained, but did not
understand

- _____ 19. Were the methods of brucellosis transmission fully explained to you, such as the spread from animal to animal and from animal to man?
1. Yes 2. No 3. Explained, but did not understand
- _____ 20. When you have a cow abort, do you sell her, keep her, or test her for brucellosis?
1. Sell 2. Keep 3. Test
- _____ 21. If you drink raw milk from your own cow or from a neighbor's cow, is this animal tested each year for brucellosis?
1. Yes 3. Not Sure
2. No 4. Does not apply
- _____ 22. Would you be in favor of compulsory calfhood vaccination for brucellosis in both dairy and beef breed animals, paid for by the State and Federal government?
1. Yes 3. Do not favor compulsory vaccination program
2. No 4. Do not favor any vaccination program
- _____ 23. When you purchase replacement cattle, do you retest them 45-120 days after purchase to be sure they are free of brucellosis?
1. Yes 2. No 3. Sometimes
- _____ 24. Are you satisfied with the current market cattle identification surveillance system (blood test for market and slaughter cattle) and the milk ring test for dairies?
1. Yes 2. No 3. Prefer different method. If so, what method _____
- _____ 25. Would you be willing to vaccinate your herd with strain 19 (adult vaccination) if you had a problem infected herd?
1. Yes 3. Not Sure
2. No 4. Do not understand all the rules covering adult vaccination

APPENDIX C
SURVEY RESULTS
(1982)

Q 01 Area C - HERD QUARANTINED

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	337	96.8	96.8
No	9	2.6	99.4
Not Sure	1	.3	99.7
No Response	1	.3	100.0
TOTAL	348	100.0	

Q 02 Area C - MEETINGS IN YOUR AREA

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FRFQ (PCT)
Yes	132	38.0	38.0
No	69	19.8	57.8
Not Sure	146	41.9	99.7
No Response	1	.3	100.0
TOTAL	348	100.0	

Q 01 Area B - HERD QUARANTINED

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	35	94.6	94.6
No	1	2.7	97.3
Not Sure	0		
No Response	1	2.7	100.0
TOTAL	37	100.0	

Q 02 Area B - MEETINGS IN YOUR AREA

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	11	30.0	30.0
No	9	24.3	54.3
Not Sure	16	43.0	97.3
No Response	1	2.7	100.0
TOTAL	37	100.0	

Q 03 Area C - REASONS FOR NOT ATTENDING MEETING

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Distance	6	1.7	1.7
Time Conflict	72	20.7	22.4
Not Concerned	24	6.9	29.3
No Meeting	128	36.8	66.1
No Response	118	33.9	100.0
TOTAL	348	100.0	

Q 04 Area C - UNDERSTAND BRUCELLOSIS REGULATIONS

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	250	71.8	71.8
No	35	10.1	81.9
Not Sure	62	17.8	99.7
No Response	1	.3	100.0
TOTAL	348	100.0	

Q 03 Area B - REASONS FOR NOT ATTENDING MEETING

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (FCT)
Distance	0	0	0
Time Conflict	10	27.0	27.0
Not Concerned	2	5.0	32.0
No Meeting	15	41.0	73.0
No Response	10	27.0	100.0
TOTAL	37	100.0	

Q 04 Area B - UNDERSTAND BRUCELLOSIS REGULATIONS

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	27	73.0	73.0
No	5	13.5	86.5
Not Sure	4	10.6	97.3
No Response	1	2.7	100.0
TOTAL	37	100.0	

Q 05 Area C - NEIGHBORS HERD TESTED

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	95	27.3	27.3
No	161	46.2	73.5
Not Sure	89	25.5	99.0
No Response	3	1.0	100.0
TOTAL	348	100.0	

Q 06 Area C - HERD MANAGEMENT EVALUATED

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	224	64.4	64.4
No	102	29.3	93.7
Not Sure	20	5.7	99.4
No Response	2	.6	100.0
TOTAL	348	100.0	

Q 05 Area B - NEIGHBORS HERD TESTED

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	12	32.4	32.4
No	18	48.6	81.0
Not Sure	7	19.0	100.0
No Response	0	0	
TOTAL	37	100.0	

Q 06 Area B - HERD MANAGEMENT EVALUATED

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	26	70.0	70.0
No	7	19.0	89.0
Not Sure	4	11.0	100.0
No Response	0		
TOTAL	37	100.0	

Q 07 Area C - NUMBER OF TIMES HERD TESTED

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
0	2	.6	.6
1	7	2.0	2.6
2	30	8.6	11.2
3	77	22.1	33.3
4	58	16.7	50.0
5	39	11.2	61.2
6	25	7.2	68.4
7	15	4.3	72.7
8	19	5.4	78.1
9	7	2.0	80.1
10	13	3.7	83.8
11	2	.6	84.4
12	6	1.7	86.1
13	1	.3	86.4
14	3	.9	87.3
15	5	1.4	88.7
16	2	.6	89.3
17	1	.3	89.6
18	1	.3	89.9
20	1	.3	90.2
22	1	.3	90.5
24	1	.3	90.8
27	1	.3	91.1
28	1	.3	91.4
30	1	.3	91.7
75	1	.3	92.0
Numerous	23	6.6	98.6
No Response	5	1.4	100.0
TOTAL	348	100.0	

Q 07 Area B - NUMBER OF TIMES HERD TESTED

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
2	1	2.7	2.7
3	6	16.2	18.9
4	5	13.6	32.5
5	6	16.2	48.7
6	9	24.3	73.0
7	2	5.4	78.4
8	1	2.7	81.1
9	1	2.7	83.8
11	1	2.7	86.5
12	1	2.7	89.2
13	1	2.7	91.9
15	1	2.7	94.6
25	1	2.7	97.3
Numerous	1	2.7	100.0
TOTAL	37	100.0	

Q 08 Area C - DID PERSON TESTING YOUR HERD EXPLAIN THE QUARANTINE PROCEDURE?

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	295	84.8	84.8
No	41	11.8	96.6
Didn't Understand	9	2.6	99.2
No Response	3	.8	100.0
TOTAL	348	100.0	

Q 09 Area C - WILL PRESENT PROGRAM ERADICATE BRUCELLOSIS?

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	69	19.8	19.8
No	192	55.2	75.0
Not Sure	86	24.7	99.7
No Response	1	.3	100.0
TOTAL	348	100.0	

Q 08 Area B - DID PERSON TESTING YOUR HERD EXPLAIN THE QUARANTINE PROCEDURE?

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	32	86.5	86.5
No	2	5.4	91.9
Didn't Understand	3	8.1	100.0
No Response	0		
TOTAL	37	100.0	

Q 09 Area B - WILL PRESENT PROGRAM ERADICATE BRUCELLOSIS?

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	9	24.3	24.3
No	21	56.8	81.1
Not Sure	7	18.9	100.0
No Response	0		
TOTAL	37	100.0	

Q 10 Area C - BRUCELLOSIS CONTAGIOUS TO PEOPLE OF ALL AGES

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	303	87.1	87.1
No	40	11.5	98.6
No Response	5	1.4	100.0
TOTAL	348	100.0	

Q 11 Area C - WILL YOU PRACTICE CALFHOOD VACCINATION?

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	316	90.8	90.8
No	13	3.8	94.6
Not Sure	15	4.3	98.9
No Response	4	1.1	100.0
TOTAL	348	100.0	

Q 10 Area B - BRUCELLOSIS CONTAGIOUS TO PEOPLE OF ALL AGES

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	31	83.8	83.8
No	5	13.5	97.3
No Response	1	2.7	100.0
TOTAL	37	100.0	

Q 11 Area B - WILL YOU PRACTICE CALFHOOD VACCINATION?

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	30	81.1	81.1
No	5	13.5	94.6
Not Sure	0		
No Response	2	5.4	100.0
TOTAL	37	100.0	

Q 12 Area C - BRUCELLOSIS INFECTION IN SWINE, GOAT, SHEEP, HORSES

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	193	55.4	55.4
No	102	29.3	84.7
Only aware of a few	50	14.4	99.1
No Response	3	.9	100.0
TOTAL	348	100.0	

Q 13 Area C - INDEMNITY PROGRAM SUFFICIENT

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	95	27.3	27.3
No	246	70.7	98.0
Not Informed of Indemnity	2	.6	98.6
No Response	5	1.4	100.0
TOTAL	348	100.0	

Q 12 Area B - BRUCELLOSIS INFECTION IN SWINE, GOAT, SHEEP, HORSES

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	21	56.8	56.8
No	8	21.6	78.4
Only aware of a few	7	18.9	97.3
No Response	1	2.7	100.0
TOTAL	37	100.0	

Q 13 Area B - INDEMNITY PROGRAM SUFFICIENT

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	4	10.8	10.8
No	32	86.5	97.3
Not Informed of Indemnity	0		
No Response	1	2.7	100.0
TOTAL	37	100.0	

Q 14 Area C - APPLY BRUCELLOSIS LAW TO SHEEP AND SWINE

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	194	55.8	55.8
No	37	10.6	66.4
Not Sure	113	32.5	98.9
No Response	4	1.1	100.0
TOTAL	348	100.0	

Q 15 Area C - DID YOU CALFHOOD VACCINATE?

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	221	63.5	63.5
No	106	30.5	94.0
Sometimes	20	5.7	99.7
No Response	1	.3	100.0
TOTAL	348	100.0	

Q 14 Area B - APPLY BRUCELLOSIS LAW TO SHEEP AND SWINE

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	15	40.6	40.6
No	7	18.9	59.5
Not Sure	14	37.8	97.3
No Response	1	2.7	100.0
TOTAL	37	100.0	

Q 15 Area B - DID YOU CALFHOOD VACCINATE?

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	19	51.4	51.4
No	16	43.2	94.6
Sometimes	1	2.7	97.3
No Response	1	2.7	100.0
TOTAL	37	100.0	

Q 16 Area C - AGE CALVES ARE VACCINATED

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
3-4 Mo.	17	4.9	4.9
5-6 Mo.	94	27.0	31.9
7-8 Mo.	89	25.6	57.5
8 Mo. +	42	12.0	69.5
Do Not Vaccinate	99	28.5	98.0
No Response	7	2.0	100.0
TOTAL	348	100.0	

Q 17 Area C - REDUCED DOSAGE STRAIN 19 EXPLAINED

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	197	56.6	56.6
No	125	35.9	92.5
Didn't Understand	24	6.9	99.4
No Response	2	.6	100.0
TOTAL	348	100.0	

Q 16 Area B - AGE CALVES ARE VACCINATED

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
3-4 Mo.	2	5.4	5.4
5-6 Mo.	14	37.8	43.2
7-8 Mo.	3	8.1	51.3
8 Mo. +	1	2.7	54.0
Do Not Vaccinate	15	40.6	94.6
No Response	2	5.4	100.0
TOTAL	37	100.0	

Q 17 Area B - REDUCED DOSAGE STRAIN 19 EXPLAINED

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	20	54.1	54.1
No	12	32.4	86.5
Didn't Understand	3	8.1	94.6
No Response	2	5.4	100.0
TOTAL	37	100.0	

Q 18 Area C - LABORATORY METHODS EXPLAINED

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	176	50.6	50.6
No	150	43.1	93.7
Didn't Understand	21	6.0	99.7
No Response	1	.3	100.0
TOTAL	348	100.0	

Q 19 Area C - BRUCELLOSIS TRANSMISSION EXPLAINED

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	228	65.5	65.5
No	94	27.0	92.5
Didn't Understand	20	5.7	98.2
No Response	6	1.8	100.0
TOTAL	348	100.0	

Q 18 Area B - LABORATORY METHODS EXPLAINED

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	16	43.3	43.3
No	15	40.5	83.8
Didn't Understand	3	8.1	91.9
No Response	3	8.1	100.0
TOTAL	37	100.0	

Q 19 Area B - BRUCELLOSIS TRANSMISSION EXPLAINED

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	26	70.3	70.3
No	8	21.6	91.9
Didn't Understand	3	8.1	100.0
No Response	0	0	
TOTAL	37	100.0	

Q 20 Area C - IS A COW THAT ABORTS SOLD, KEPT OR TESTED?

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Sell	169	48.6	48.6
Keep	31	8.9	57.5
Test	132	37.9	95.4
No Response	16	4.6	100.0
TOTAL	348	100.0	

Q 21 Area C - IF YOU DRINK RAW MILK, IS COW TESTED?

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	18	5.2	5.2
No	17	4.9	10.1
Not Sure	8	2.3	12.4
Does Not Apply	293	84.2	96.6
No Response	12	3.4	100.0
TOTAL	348	100.0	

Q 20 Area B - IS A COW THAT ABORTS SOLD, KEPT OR TESTED?

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Sell	11	29.7	29.7
Keep	5	13.5	43.2
Test	19	51.4	94.6
No Response	2	5.4	100.0
TOTAL	37	100.0	

Q 21 Area B - IF YOU DRINK RAW MILK, IS COW TESTED?

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	3	8.1	8.1
No	1	2.7	10.8
Not Sure	1	2.7	13.5
Does Not Apply	29	78.4	91.9
No Response	3	8.1	100.0
TOTAL	37	100.0	

Q 22 Area C - COMPULSORY CALFHOOD VACCINATION FOR BRUCELLOSIS

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	286	82.2	82.2
No	22	6.3	88.5
Against Compulsory Vaccination	24	6.9	95.4
Against Any Vaccination	5	1.4	96.8
No Response	11	3.2	100.0
TOTAL	348	100.0	

Q 23 Area C - RETEST PURCHASED CATTLE 45 - 120 DAYS

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	95	27.3	27.3
No	159	45.7	73.0
Sometimes	41	11.8	84.8
Do Not Buy	37	10.6	95.4
No Response	16	4.6	100.0
TOTAL	348	100.0	

Q 22 Area B - COMPULSORY CALFHOOD VACCINATION FOR BRUCELLOSIS

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	26	70.3	70.3
No	4	10.8	81.1
Against Compulsory Vaccination	5	13.5	94.6
Against Any Vaccination	1	2.7	97.3
No Response	1	2.7	100.0
TOTAL	37	100.0	

Q 23 Area B - RETEST PURCHASED CATTLE 45 - 120 DAYS

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	15	40.6	40.6
No	14	37.8	78.4
Sometimes	4	10.8	89.2
Do Not Buy	2	5.4	94.6
No Response	2	5.4	100.0
TOTAL	37	100.0	

Q 24 Area C - ARE YOU SATISFIED WITH MCI AND BRT?

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	222	63.8	63.8
No	82	23.6	87.4
Different Method	25	7.2	94.6
No Response	19	5.4	100.0
TOTAL	348	100.0	

Q 25 Area C - ADULT VACCINATION WITH STRAIN 19

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	181	52.0	52.0
No	39	11.2	63.2
Not Sure	33	9.5	72.7
Didn't Understand	63	18.1	90.8
Have Vaccinated	28	8.0	98.8
No Response	4	1.2	100.0
TOTAL	348	100.0	

Q 24 Area B - ARE YOU SATISFIED WITH MCI AND BRT?

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	23	62.2	62.2
No	9	24.3	86.5
Different Method	3	8.1	94.6
No Response	2	5.4	100.0
TOTAL	37	100.0	

Q 25 Area B - ADULT VACCINATION WITH STRAIN 19

CATEGORY	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	CUM FREQ (PCT)
Yes	18	48.7	48.7
No	5	13.5	62.2
Not Sure	8	21.6	83.8
Didn't Understand	5	13.5	97.3
Have Vaccinated	1	2.7	100.0
No Response	0		
TOTAL	37	100.0	

APPENDIX D
SURVEY RESULTS
(1977)
QUESTIONS USED FOR COMPARISON

Q 04 UNDERSTAND TEXAS LAW ON BRUCELLOSIS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
Yes	1.	231	68.8	69.9	69.6
No	2.	23	6.6	6.9	76.5
Not Sure	3.	77	22.9	23.2	99.7
	4.	1	.3	.3	100.0
No Response	0	4	1.2	Missing	100.0
TOTAL		336	100.0	100.0	

Q 08 TESTER EXPLAIN WHAT WAS BEING DONE

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
Yes	1.	288	85.7	87.3	87.3
No	2.	30	8.9	9.1	96.4
Did Not Understand	3.	12	3.6	3.6	100.0
No Response	0	6	1.8	Missing	100.0
TOTAL		336	100.0	100.0	

Q 09 APPROACH TO ERADICATE BRUCELLOSIS WILL BE SUCCESSFUL

CATEGORY LEVEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
Yes	1.	59	17.6	17.7	17.7
No	2.	212	63.1	63.7	81.4
Do Not Know	3.	62	18.5	18.6	100.0
No Response	0	3	.9	Missing	100.0
TOTAL		336	100.0	100.0	

Q 10 BRUCELLOSIS CONTAGIOUS TO PEOPLE OF ALL AGES

CATEGORY LEVEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
Yes	1.	290	86.3	87.9	87.9
No	2.	40	11.9	12.7	100.0
No Response	0	6	1.8	Missing	100.0
TOTAL		336	100.0	100.0	

Q 12 BRUCELLOSIS INFECTION IN SWINE, GOATS, SHEEP, DOGS, HORSES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
Yes	1.	204	60.7	61.8	61.8
No	2.	77	22.9	23.3	85.2
Only Aware of A Few	3.	49	14.6	14.8	100.0
No Response	4.	7	1.8	Missing	100.0
TOTAL		336	100.0	100.0	

Q 15 CALFHOOD VACCINATION FOR BRUCELLÖSIS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
Yes	1.	125	37.2	37.8	37.8
No	2.	185	55.1	55.9	93.7
Only Sometimes	3.	21	6.3	6.3	100.0
No Response	0	5	1.5	Missing	100.0
TOTAL		336	100.0	100.0	

Q 16 AGE OF VACCINATION FOR CALVES

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
3-4 Mo.	1.	52	15.5	15.0	16.0
5-6 Mo.	2.	70	20.8	21.5	37.5
7-8 Mo.	3.	21	6.3	6.5	44.0
8 Mo.+	4.	7	2.1	2.2	46.2
No Vac.	5.	195	52.1	53.8	100.0
No Response	0	11	3.3	Missing	100.0
TOTAL		336	100.0	100.0	

Q 21 RAW MILK SUPPLY TESTED EACH YEAR FOR BRUCELLOSIS

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
Yes	1.	37	11.0	11.3	11.3
No	2.	31	9.2	9.5	20.9
Not Sure	3.	3	.9	.9	21.8
Does Not Apply	4.	255	75.9	78.2	100.0
No Response	0	10	3.0	Missing	100.0
TOTAL		336	100.0	100.0	

Q 24 ARE YOU SATISFIED WITH MCI AND BRT

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
Yes	1.	154	45.8	48.4	48.4
No	2.	109	32.4	34.3	82.7
Would Per Diff Met	3.	55	16.4	17.3	100.0
No Response	0	18	5.4	Missing	100.0
TOTAL		336	100.0	100.0	

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Erwin Daniel Jemelka was born to Daniel and Lillie Jemelka February 22, 1943, in Yoakum, Texas. He attended St. Joseph's School in Yoakum through his high school years and enrolled in the Pre-Veterinary curriculum at Victoria College, Victoria, Texas in 1961. He continued his studies at Texas A&M University, College Station, Texas and earned the Doctor of Veterinary Medicine degree in 1967. He completed his two year USAF commitment at Whiteman AFB Missouri, and subsequently joined a mixed private practice. Shortly after, he began his public health career in Veterinary Public Health with the Texas State Department of Health where he was employed in the Cooperative Meat Inspection section. Dr. Jemelka resumed his USAF career in 1974, and has been stationed at Subic Bay Naval Station, Phillipines, and Castle AFB, California. He was promoted to the rank of Major while stationed at Castle AFB, and was accepted into the Air Force Institute of Technology (AFIT) program to begin study in 1982 towards a Master's Degree in Public Health at The University of Texas Health Science Center, San Antonio, Texas.

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