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Cows, Cattle Owners, and the USDA: Brucellosis, Populations, and Public Health Policy in Twentieth Century United States

by

Rebecca Kaplan

DISSERTATION

Submitted in partial satisfaction of the requirements for the degree of

DOCTOR OF PHILOSOPHY

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in the

GRADUATE DIVISION

of the

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by
Rebecca Kaplan

To my parents

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Abstract

Cows, Cattle Owners, and the USDA: Brucellosis, Populations, and Public Health Policy in Twentieth Century United States

This dissertation explores the conceptualization of brucellosis as a disease and the development of the state-federal brucellosis eradication program. It examines what economic, political, societal, cultural, agricultural, occupational, medical, scientific, and technological factors influenced development of eradication procedures for brucellosis in the United States and which groups of people impacted brucellosis policy. It draws on many different sources including government and organizational records and publications, legal documents, educational material, and trade, scientific, and popular publications. The dissertation serves as a lens to explore the historic relationship between animal and public health, science, agricultural practices, societal norms, and political forces by drawing together research and concepts from history of medicine, public health, science and technology studies, agricultural history, and American political history.

Many different stake-holders influenced the understanding of brucellosis as a disease in both animals and humans and eradication policy. Dairy producers, range cattle owners, veterinarians, state and federal animal health officials, researchers in both animal and human health, consumers, and politicians all played a role in the conceptualization of the disease and its eradication policy. Within each of these groups, different factions held various viewpoints on the epidemiology of the disease, the need for brucellosis eradication, and the role of the government in eradication. These positions often evolved based on economic interests, environment and geography, agricultural practices, and interpretation of scientific data. In addition to different groups and organizations, the biology of the bacterium and its transmission between animals and

species shaped the understanding of the disease and the attempts to control or eradicate it. This dissertation also explores the relationship between animal and human medicine and how the groups involved with brucellosis eradication policy negotiated issues of human health and animal health. The dissertation focuses on how contagious abortion and undulant fever, two seemingly unrelated diseases in two different populations, cattle and humans, became one disease, brucellosis, and under what circumstances the state-federal plan to end the disease in the United States developed and evolved during the twentieth century.

Table of Contents

List of Acronyms ix

Introduction 1

Chapter 1:
Cattle Raising in the United States and the Development of the Bureau of Animal Industry in the Late Nineteenth Century and Early Twentieth Century 12

Chapter 2:
Abortion Storms and Bacteria – The Conceptualization of Contagious Abortion and Its Relationship with Human Disease, 1850 – 1929 52

Chapter 3:
A Major Minor Disease –
The Relationship of Contagious Abortion and Undulant Fever and Its Control, 1929 – 1941 93

Chapter 4:
Development of a State-Federal Cooperative 1942 – 1955 128

Chapter 5:
The Accelerated Brucellosis Eradication Program 1955 – 1970 161

Chapter 6:
Control or Eradication?
The State – Federal Brucellosis Eradication Program, 1970 – 1977 215

Chapter 7:
Cutting the Tail Off the Dragon –
The Eradication of Brucellosis in the United States, 1978 – 2000 267

Epilogue 335

Bibliography
Primary Sources 355
Secondary Sources 397

List of Acronyms

Agricultural Adjustment Act (AAA)
Agricultural Research Service (ARS)
Animal and Plant Health Inspection Service (APHIS)
Associated Milk Producers, Inc. (AMPI)
Brucellosis Ring Test (BRT)
Bureau of Animal Industry (BAI)
Market Cattle Identification (MCI)
Market Cattle Test (MCT)
National Brucellosis Committee (NBC)
National Brucellosis Technical Commission (NBTC)
National Cattlemen's Association (NCA)
Office of Management and Budget (OMB)
Texas and Southwestern Cattle Raisers Association (TSCRA)
Texas Animal Health Commission (TAHC)
Uniform Method and Rules (UMR)
United States Animal Health Association (USAHA)
United States Department of Agriculture (USDA)
United States Livestock Sanitary Association (USLSA)
United States Public Health Service (USPHS)

Introduction

> Brucellosis is a contagious disease of livestock and wildlife that has significant consequences for animal and public health and international trade.[1]

In the first sentence of the National Bovine Brucellosis Surveillance Plan, officials at the United States Department of Agriculture's (USDA) Veterinary Services concisely summarize why the department continues to test domesticated cattle and bison for brucellosis (also known as Bang's disease and contagious abortion in animals) and treats any known cases as a potential epizootic situation. Though no cases of brucellosis have been reported in domesticated cattle or bison since 2012, the federal government, states, and cattle owners invest in active surveillance of cattle for the disease because its return poses an economic threat to the multibillion dollar cattle industry.[2] If the United States government and cattle owners allowed brucellosis to reemerge in domestic herds, the loss of calf production, the decrease in milk production, and bans on importing brucellosis-exposed cattle in other countries would significantly damage the economics of the agricultural sector and the supply chain for meat and dairy products.[3] Through the active surveillance plan, the USDA hopes to prevent economic loss due to brucellosis and protect the health of American cattle and bison herds.

The bacteria *Brucella abortus*, which causes most cases of bovine brucellosis, is a risk not just to cattle and bison, but also to humans.[4] Like the Department of Agriculture, the Centers for Disease

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[1]Veterinary Services, "National Brucellosis Surveillance Plan," Animal and Plant Health Inspection Service, United States Department of Agriculture, http://www.aphis.usda.gov/animal_health/animal_diseases/brucellosis/downloads/nat_bruc_surv_plan.pdf (accessed May 04, 2013), 3.

[2]"Bovine Tuberculosis and Brucellosis Surveillance Results Monthly Reports, Federal Fiscal Year (FY) 2013 April 1-30," 2013, Animal and Plant Health Inspection Service, United States Department of Agriculture, http://www.aphis.usda.gov/animal_health/tb_bruc/downloads/affected_herd_monthly_summary_apr2013.pdf (accessed May 04, 2013), 3.

[3]Veterinary Services, 7.

[4]There are multiple species of *Brucella* that are all closely related. While they are mainly animal specific, they can cross from one species of mammal to another. *Brucella abortus* is the species of Brucella associated with cattle and bison, but it is possible for these animals to be infected with *Brucella melitensis*, the goat species of the bacterium, or *Brucella suis*, the

Control and Prevention monitors for brucellosis (also known as undulant fever in humans) outbreaks by listing it as a notifiable disease. Caused by consumption of raw milk and dairy products, occupational exposure, and recreational exposure, the CDC reported 115 cases of the disease in 2010.[5] While brucellosis has a relatively small death rate and can usually be treated in humans with antibiotics, it often causes fevers and symptoms that can plague people for weeks or months.[6] The bovine brucellosis surveillance plan impacts the number of human cases of the disease since brucellosis primarily spreads from animals-to-humans and not from person-to-person. Without control of the disease in cattle, potential exposure to brucellosis increases for consumers and those who work with livestock. The Department of Agriculture's surveillance plan and the prevention of brucellosis in cattle herds affect not only livestock economics and health but also public health.

The current USDA surveillance program to prevent the reemergence of bovine brucellosis was not created in the twenty-first century but is an extension of the federal government's effort to eradicate *B. abortus* in livestock in the previous century. During the twentieth century, the state-federal

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swine species of the bacterium. There are also species of Brucella specific to sheep, dogs, seals, elk, and various other mammals. Most human cases of brucellosis are caused by the cattle, goat, and swine species of *Brucella*. While brucellosis in domesticated cattle and swine has been effectively eradicated in the United States, people still contract brucellosis through consumption of raw dairy during travel, exposure to the bacteria in a laboratory setting, accidental needle-sticks while vaccinating for the disease, or from the handling of infected wild game such as feral hogs, elk, and bison. The disease is almost always zoonotic though it can transfer person-to-person. Cases of sexually transmitted brucellosis, along with cases resulting from organ transplant, blood transfusions, or breastfeeding have been rarely reported.
Centers for Disease Control and Prevention, "Summary of Notifiable Diseases--United States, 2010," Morbidity and Mortality Weekly Report 59, no. 53 (2012), http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5953a1.htm (accessed May 04, 2013).
"Transmission-Brucellosis," Centers for Disease Control and Prevention, http://www.cdc.gov/brucellosis/transmission/index.html (accessed May 04, 2013).

[5]Brucellosis is a notifiable disease in part due to the potential threat it poses as a biological weapon. The cattle, goat, and swine species of the bacteria can be aerosolized and used in bioterrorism acts. The reporting and investigation of suspected brucellosis cases serves as a way to monitor for potential bioterrorism. Since brucellosis is a relatively rare disease, the federal government hopes that actively monitoring for it will allow health and defense officials to quickly track cases of biological weapon use versus those caused by more conventional routes of transmission.
Centers for Disease Control and Prevention, "Summary of Notifiable Diseases--United States, 2010".
Centers for Disease Control and Prevention, "Suspected Brucellosis Case Prompts Investigation of Possible Bioterrorism-Related Activity--New Hampshire and Massachusetts, 1999," *Morbidity and Mortality Weekly Report* 49, no. 23 (2000), http://www.cdc.gov/mmwr/preview/mmwrhtml/mm4923a1.htm (accessed May 04, 2013).

[6]M. Monir Madkour, *Madkour's Brucellosis* (Berlin: Springer, 2000), 2-10.

cooperative brucellosis eradication program effectively eliminated brucellosis in bovines through culling, monitoring, quarantine, and vaccination, and by eradicating the bacteria in cattle, the program controlled the source of infection for humans. This dissertation assesses how the disease caused by *Brucella abortus* became known as brucellosis and how brucellosis control in the United States developed during the twentieth century. It explores what economic, political, societal, cultural, agricultural, occupational, medical, scientific, and technological factors influenced development of control and eradication procedures for brucellosis in the United States and which groups of people impacted brucellosis policy. Many different stake-holders influenced the understanding of brucellosis as a disease in both animals and humans and eradication policy. Cattle owners, veterinarians, state and federal animal health officials, researchers in both animal and human health, consumers, and politicians all played a role in the conceptualization of the disease and its eradication policy. Within each of these groups, different factions held various viewpoints on the epidemiology of the disease, the need for brucellosis eradication, and the role of the government in eradication. These positions often evolved based on economic interests, environment and geography, agricultural practices, and interpretation of scientific data. In addition to different groups and organizations, the biology of the bacterium and its transmission between animals and species shaped the understanding of the disease and the attempts to control or eradicate it. This dissertation also explores the relationship between animal and human medicine and how the groups involved with brucellosis eradication policy negotiated issues of human health and animal health. The dissertation focuses on how abortion storms and Malta fever, two seemingly unrelated diseases in two different populations, cattle and humans, became one disease, brucellosis, and under what circumstances the state-federal plan to end the disease in the United States developed and evolved during the twentieth century. It serves as a lens to explore the historic relationship between animal and human health, public health, science, agricultural practices, societal

norms, and political forces by drawing together research and concepts from history of medicine, public health, science and technology studies, agricultural history, and American political history.

The history of brucellosis control in the United States is an untold story. Most of the existing history of the disease comes from researchers tracing scientific discoveries or policy decisions about the disease for articles on brucellosis research or policy. Many articles on Sir David Bruce, Sir Themistocles Zammit, the Malta Fever Commission, or Alice C. Evans include historical information on the scientific understanding of brucellosis and policy response to the disease as it relates to the subject of the article. Brucellosis also appears as a side note in some histories of the United States biological weapons program, the bovine tuberculosis eradication program, the cattle industry, pasteurization, and the Bureau of Animal Industry.[7] These accounts trace the chronological development of medical understanding of brucellosis and the creation of the state-federal brucellosis eradication program but provide no analysis or context for this progression.

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[7]Gladys L. Baker et al., Century of Service: The First 100 Years of the United States Department of Agriculture (Washington, D.C.: Centennial Committee, U.S. Dept. of Agriculture, 1963).
Barton J. Bernstein, "The Birth of the U.S. Biological-Warfare Program," *Scientific American* 256, no. 6 (1987): 116-121.
Yana Bland, "The Economics of Imperialism and Health: Malta's Experience," *International Journal of Health Services* 24, no. 3 (1994): 549-566.
George W. Christopher et al., "History of U.S. Military Contributions to the Study of Bacterial Zoonoses," *Military Medicine* 170, no. 4 (2005): 39-48.
Rita R. Colwell, "Original Contributions - Alice C Evans: Breaking Barriers," *The Yale Journal of Biology and Medicine* 72, no. 5 (1999): 349-356.
Susan D. Jones, *Valuing Animals: Veterinarians and Their Patients in Modern America* (Baltimore: Johns Hopkins University Press, 2003).
Anne Mendelson, ""In Bacteria Land": The Battle over Raw Milk," *Gastronomica: The Journal of Food and Culture* 11, no. 1 (2011): 35-43.
S.W.B. Newsom, "Brucellosis, or Mediterranean Fever," *British Journal of Infection Control* 8, no. 5 (2007): 13-16.
Paul Nicoletti, "A Short History of Brucellosis," *Veterinary Microbiology* 90, no. 1 (2002): 5-9.
G. Pappas et al., "Brucella as a Biological Weapon," *Cellular and Molecular Life Sciences.* 63 (2006): 2229-2236.
Valerie E Ragan, "The Animal and Plant Health Inspection Service (APHIS) Brucellosis Eradication Program in the United States". *Veterinary Microbiology* 90, no. 1 (2002): 11-18.
John T. Schlebecker, *Cattle Raising on the Plains, 1900-1961* (Lincoln: University of Nebraska Press, 1963).
D. J. Vassallo, "The Corps Disease: Brucellosis and its Historical Association with the Royal Army Medical Corps," *Journal of the Royal Army Medical Corps* 138 (1992): 140-150.
D. J. Vassallo, "The Saga of Brucellosis: Controversy over Credit for Linking Malta Fever with Goats' Milk," *Lancet* 348, no. 9030 (1996): 804-808.
H. V. Wyatt, "How Themistocles Zammit Found Malta Fever (Brucellosis) to be Transmitted by the Milk of Goats," *Journal of the Royal Society of Medicine* 98, no. 10 (2005): 451-454.

While the story of brucellosis control in the United States and the context in which it developed has not been extensively researched, work on the disease's control in Britain has been published. In an article from 2009, Abigail Woods explored early attempts at brucellosis control in Britain during the late nineteenth and early twentieth century.[8] The British contagious abortion policy story has many similarities to the narrative of how brucellosis eradication developed in the United States. This includes the cooperative nature of brucellosis research and policy, the importance of economic concerns for cattle owners, and the role of the bacteria's biology. Woods found that farmers and agricultural societies shaped understanding of contagious abortion, the research conducted by scientists, and policy designed by the state to control the disease. At the time, the British government attempted to eradicate brucellosis through mandating the reporting of abortions, but struggled to gain support in areas where farmers seemed less concerned about contagious abortion and its impact on production. The program also suffered due to biological realities of the disease and the lack of accurate testing. The idea of control through vaccination became popular with some cattle owners and veterinarians, but the efficiency of the vaccine remained unknown in the early twentieth century. Unlike this dissertation, Woods did not continue to trace the changing understanding of brucellosis and the development of eradication policy in Britain after the discovery of the link between contagious abortion and undulant fever.

Recently a number of contemporary scholars used the development of animal disease control programs to analyze the relationship between the state, its citizens, and animals. They studied a particular animal disease in a population or location to address how diseases are reconceptualized and controlled over time due to changes in medical theory, technology, societal and cultural norms, agricultural practices, veterinary medical practices, political structures, and the epidemiology of the

[8]Abigail Woods, "'Partnership' in Action: Contagious Abortion and the Governance of Livestock Disease in Britain, 1885-1921," *Minerva* 47, no. 2 (2009): 195-216.

diseases. These researchers also utilized animal disease and veterinary medicine to understand the relationship between animal and human health, industry and the state, and governments. Books such as *A Manufactured Plague* by Abigail Woods (foot-and-mouth disease), *Mad Dogs and Englishmen* by Neil Pemberton and Michael Worboys (rabies), *Death in a Small Package* by Susan Jones (anthrax), *Making Catfish Bait Out of Government Boys* by Claire Strom (tick fever), and the essays in *Healing the Herds* edited by Karen Brown and Daniel Gilfoyle (multiple diseases including rinderpest, anthrax, contagious bovine pleuropneumonia, East Coast fever, and glanders) serve as examples of how to effectively examine the complex interaction of changes in scientific and medical knowledge and technological innovation with social, cultural, economic, industrial and political transformation through the exploration of the understanding of an animal disease and the attempt to control or eradicate it.[9]

This dissertation follows these works by using the cattle disease brucellosis as a unique lens to study these questions. My work investigates how farmers, veterinarians, consumers, physicians, researchers, animal health officials, and politicians impacted the understanding of brucellosis, the development of a state-federal program to eradicate the disease, and the changes to the disease eradication program as the state tried to eliminate *B. abortus* in domesticated cattle. This includes exploring subdivisions within these groups, the relationship between different stake-holders, and the importance of professional organizations, cooperatives, and the United States' network of scientific agriculture. The dissertation also explores how the biology of the *B. abortus*, the understanding of its biology, and the epidemiology of the diseases caused by it played a role in the conceptualization of

[9]Abigail Woods, *A Manufactured Plague: The History of Foot-and-Mouth Disease in Britain* (London: Earthscan, 2004).
Neil Pemberton and Michael Worboys, *Mad Dogs and Englishmen: Rabies in Britain, 1830-2000* (Basingstoke: Palgrave Macmillan, 2007).
Susan D. Jones, *Death in a Small Package: A Short History of Anthrax* (Baltimore: Johns Hopkins University Press, 2010).
Claire Strom, *Making Catfish Bait Out of Government Boys: The Fight Against Cattle Ticks and the Transformation of the Yeoman South* (Athens: University of Georgia Press, 2009).
Karen Brown and Daniel Gilfoyle ed., *Healing the Herds: Disease, Livestock Economies, and the Globalization of Veterinary Medicine* (Athens: Ohio University Press, 2010).

brucellosis and the development of eradication policy. In addition, the realities of the agricultural industry and its changing practices along with changes in scientific and veterinary medical practices impacted brucellosis control and how different segments of the cattle industry perceived the threat of the disease. All of these factors shaped the conceptualization of brucellosis and individual, state, and federal brucellosis control or eradication policy.

Unlike some diseases studied by historians, brucellosis is not a disease that has recently emerged as a headline generating epizootic or zoonotic threat nor are most people in the United States familiar with the disease. Not only is brucellosis almost unknown by the general populations in the few countries that have eradicated the disease in domesticated animals, but it often goes unrecognized and unreported in countries with endemic infection including those in the Mediterranean area, north and east Africa, the Middle East, south and central Asia, and Central and South America.[10] Brucellosis is a livestock disease that causes relatively little economic damage to an individual animal and a zoonosis that poses a minor threat to public health, but it is difficult to study or diagnose and *Brucella* infection has potentially devastating economic and zoonotic health implications. In the United States during the twentieth century, many farmers, veterinarians, physicians, animal disease control officials, and researchers perceived brucellosis to be a minor disease risk compared to cattle epizootics like foot-and-mouth disease or zoonoses like bovine tuberculosis, but at the same time, a major disease risk when viewed from an economic perspective or as an occupational health risk. Economics, biology, and the epidemiology of the disease shifted and changed people's understanding of brucellosis and its risk to the cattle population and public health. Studying the development of the brucellosis eradication program in the United States serves as a way to assess the relationship of economics, science, and health and how cattle owners, veterinarians, researchers, and animal disease control officials negotiate

[10]Michael J. Corbel, *Brucellosis in Humans and Animals* (Geneva: World Health Organization, 2006) http://www.who.int/csr/resources/publications/Brucellosis.pdf (accessed May 05, 2013), 1.

this relationship when creating or modifying brucellosis eradication policy. Different groups and organizations utilized economics, science, and animal or public health to justify what they thought to be the most appropriate approach to dealing with the disease. Rhetoric for or against policies grew out of these three concerns and changed with them. As the economics of owning brucellosis-free cattle, the knowledge of *B. abortus* biology, and the understanding of how the disease impacted animal and human health shifted over the twentieth century so too did the arguments for or against no government intervention, control policy, or a state-federal eradication program.

There are a number of themes and issues related to the development of brucellosis eradication and the conceptualization of it as a disease that this dissertation does not focus on or only briefly addresses. Brucellosis is a disease that affects many different mammals including livestock, pets, and wild animals in almost every country. In order to narrow the scope of the dissertation, I chose to focus on the United States where cattle became the main target of the national eradication program. Swine and goats were also covered by state and federal brucellosis eradication programs and livestock owners wanted to eradicate the disease in these animals, but cattle were the dominate animal regulated by the American eradication program. In addition to animals, this dissertation assesses the role of human infection in the development of animal disease control policy but brucellosis in humans, issues of gender, and occupational health are not extensively explored in the narrative. Another topic not discussed in this dissertation is the threat of brucellosis as a bioterrorism weapon and its development as a biological weapon by the United States government. While some American researchers worked on brucellosis both as agricultural scientists and as part of the weaponization program in the mid-twentieth century, the biological agent aspect of brucellosis did not play a role in the conceptualization of the disease by the majority of those concerned about the disease at the time nor did it significantly impact the development of the United States state-federal brucellosis eradication program.

The dissertation traces the history of brucellosis in the United States, its economic impact, the changing scientific, cultural, and political understanding of the disease, and how policy and programs to control the disease developed. Chapter one investigates the economic and cultural importance of cattle in the United States from the colonial era through the late nineteenth century and the development of government agencies rooted in scientific agriculture such as the Department of Agriculture (USDA), the Bureau of Animal Industry (BAI), and land-grant universities and private organizations that arose out of industry concerns like the United States Livestock Sanitary Association (USLSA). The chapter also explores the development of three federal attempts to eradicate cattle diseases in the late nineteenth and early twentieth centuries. The establishment, management, and outcomes of the contagious bovine pleuropneumonia, tick fever, and bovine tuberculosis eradication programs set the stage for the understanding of brucellosis as a cattle disease and the attempt to control it at the national level. This chapter draws on the history of agriculture, politics, and veterinary medicine to provide context for the discussion of animal health, economics, and animal disease control policy.

Chapter two explores the initial research on abortion storms in the late nineteenth and early twentieth centuries by animal disease researchers and how cattle owners attempted to prevent or end contagious abortions in their herds. It addresses how the rise of veterinary medicine, the growing acceptance of germ theory, and new laboratory techniques impacted the understanding of abortions as a disease and treatment of cattle for contagious abortion. The relationship between human and animal medicine and the discovery that similar bacteria caused contagious abortion and undulant fever is also investigated. Chapter three focuses on the emerging public concern about contagious abortion and the safety of the American milk supply during the 1930s and early 1940s. This chapter explores the scientific debate on the impact of brucellosis and how to control the disease in humans and animals. It

also addresses the early development of state and federal cattle brucellosis control programs through New Deal politics and the search for a *Brucella* vaccine.

The next chapter, chapter four, investigates the growing demand for a USDA based state-federal cooperative eradication program after World War II and the eventual creation of a program in the 1950s. It explores the divergent health and economic interests of dairy, breeding, and range cattle owners and how cattle owners, veterinary medical professionals, and private advisory organizations impacted the development of Department of Agriculture cattle brucellosis eradication policy that grew into the Accelerated Brucellosis Eradication Program, an industry-state-federal cooperative. Chapter five discusses the expansion and initial success of the cattle brucellosis eradication program and how technology impacted the cattle industry's ability to track and monitor cattle for brucellosis during the 1950s and 1960s. The chapter also focuses on how the program stagnated and suffered setbacks with disease reintroduction in the 1960s, the growing discontent by some cattle owners and veterinarians in the eradication program, and the scientific and legal challenges to state and federal brucellosis policy.

Chapter six explores the growing debate about brucellosis eradication policy and the merits of disease control versus eradication in the 1970s. This chapter also investigates the growing demand by cattle owners and veterinary medical professionals for more biological and epidemiological research on brucellosis, focusing on utilizing new laboratory techniques to better understand the disease and its impact on humans and animals. This call for more research results in the creation of a comprehensive investigation into the best method of control or eradication, the National Brucellosis Technical Commission (NBTC). Chapter seven opens with the results of the NBTC study and the overhaul of the brucellosis eradication program based on the findings in the late 1970s and early 1980s. It goes on to address the impact of the Reagan administration on funding for the state-federal cooperative program in the early 1980s and how industry groups, advisory groups, and government veterinary medicine

officials directed funding for the program. It explores how industry groups, veterinarians, and politicians opposing the brucellosis eradication program embraced conservative ideas of small government, reduced subsidies, and industry responsibility to justify their position while cattle owners, veterinary medical professionals, and politicians supporting the program framed brucellosis infection as a national public health and economic problem in order to justify the need for government intervention. The chapter traces the work of the brucellosis eradication program in the 1980s and 1990s to prevent reinfection in disease-free areas and fully eradicate the disease through aggressive animal disease control measures.

The state-federal brucellosis eradication program continues to be an active disease monitoring program in the United States and the last case of brucellosis in a cattle herd occurred in 2012, but this dissertation ends in 2000 with the declaration of the United States as free of bovine brucellosis in domesticated cattle for the first time. By that time, the current brucellosis eradication program had been established and while advancements in science and technology continues to change the process of monitoring for the disease, the principles of the program and justifications for the disease's eradication has not changed since the end of the twentieth century. The current program reflects the changing understanding of brucellosis as a cattle and human disease during the previous century. This dissertation traces how brucellosis transformed from an endemic cattle disease identified strictly by the symptom of abortion to an almost eradicated cattle and human infection diagnosed by testing protocols and controlled through federal monitoring and what economic concerns, political factors, societal and cultural norms, agricultural methods, medical standards, and scientific and technological changes facilitated that transition.

Chapter 1: Cattle Raising in the United States and the Development of the Bureau of Animal Industry in the Late Nineteenth Century and Early Twentieth Century

The Cow is too well known, I fear,
To need an introduction here.
If She should vanish from Earth's face
It would be Hard to fill Her place;
For with the Cow would disappear
So much that every one holds Dear.
Oh, think of all the Boots and Shoes,
Milk Punches, Gladstone Bags, and Stews
And Things too numerous to Count
Of which my Child She is the Fount!
Let's hope, at least, the Fount may last
Until Our Generation's past![1]

In his 1901 child's collection of poems about animals, Oliver Herford rhymed about the importance of the cow and cattle products. He asserted that the cow was so common, he need not describe it like the animals in his other poems, but rather he focused on the potential consequences due to the loss of cattle. As Herford pointed out, cattle product output in the early twentieth century ranged from food to clothing. Humans had long used the cow as a source for consumer items such as candles, shoes, glue, cups, and more, but their economic importance in the United States grew in the second half of the nineteenth century as new technology and government policy opened larger markets for American cattle. As the economic importance of cattle grew, so did concerns about controlling disease in the animal. Cattle and its byproducts accounted for a significant portion of America's agricultural wealth so reducing or eliminating cattle diseases protected the economic wealth of the United States.[2] In response to this concern, the United States Department of Agriculture (USDA) created the Bureau of Animal Industry (BAI) in 1884 to research and control animal diseases in order to protect the economic

[1]Oliver Herford and Victor A. Berch, *More animals* (New York: Charles Scribner's Sons, 1901), http://www.archive.org/details/moreanimals00herf (accessed March 04, 2013), 79.

[2]United States Census Office, *Report on the Productions of Agriculture as Returned at the Tenth Census* (Washington, D.C.: United States Government Printing Office, 1883), http://www.agcensus.usda.gov/Publications/Historical_Publications/1880/1880a_v3-01.pdf (accessed March 04, 2013), XV - XVI, 12, 14.

interest of animal producers. Dominated by the increasingly professionalized field of veterinary medical practitioners and accepting of germ theory, BAI researchers applied public health techniques of investigation and control to animal disease problems along with standard methods of animal disease control such as slaughter of diseased animals. While some eradication efforts became more successful than others, all of the disease eradication programs relied on the cooperation of state and local governments, veterinarians, and cattle owners. Eradication plans for cattle diseases such as pleuropneumonia, tick fever, and bovine tuberculosis demonstrated the difficult nature of convincing all of these constituencies of the necessity for a disease's eradication and balancing their needs and concerns when developing a program.

Cattle in the Americas in the Seventeenth and Eighteenth Centuries

Domesticated approximately 8,000 years ago in Southwest Asia, India, and North Africa, cattle became a source of food, material, labor, and transport for people.[3] With domestication also came zoonotic diseases that spread from the animals to humans. Some diseases like tuberculosis transferred directly between the species while others like the measles most likely mutated from cattle diseases.[4] Ancient cultures such as the Egyptians recognized this relationship of animal health and human health and healers often cared for both cattle and humans.[5] This relationship between cattle and human health dissolved during the Roman Empire and the care of domesticated animals became the responsibility of owners and cow doctors.[6] These caretakers relied on experience and shared knowledge rather than formal training to treat cattle for disease or injury.

In the eighteenth century, three major outbreaks of rinderpest ravaged the European cattle

[3]Jared M. Diamond, *Guns, Germs, and Steel: the Fates of Human Societies* (New York: W.W. Norton & Co., 1998), 167, 389.
[4]Ibid., 207.
[5]Calvin W. Schwabe, *Cattle, Priests, and Progress in Medicine* (Minneapolis: University of Minnesota Press, 1978), 40.
[6]Lise Wilkinson, *Animals and Disease: an Introduction to the History of Comparative Medicine* (Cambridge: Cambridge University Press, 1992), 38.

population. This economic devastation renewed medical practitioners' interest in cattle health and led to the development of trained veterinary medical professionals who looked to control the disease.[7] European governments sought a way to minimize the economic impact of cattle disease through government policy including increased regulation on the cattle trade along with control policies such as inoculation, quarantine, and culling.[8] Medical officials utilized human public health interventions like inoculation and quarantine, but also implemented systems of killing diseased or suspect animals and reimbursing the owners. While human public health interventions aimed to spare lives and assigned an intrinsic value to human life, the goal of animal disease interventions was to lessen the economic burden of disease. The only value assigned to an individual animal was monetary value that a government usually compensated for when it killed a domesticated animal. This made slaughter and reimbursement a valid method of disease control in animals while being an unacceptable method of disease control in human populations.

While Europe suffered from cattle plague and a shrinking cattle population in the eighteenth century, the Americas faced an overabundance of cattle. Originally introduced to the continent during

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[7]These veterinarian medicine practitioners were part of a larger European movement in the eighteenth century to improve the economics of agriculture by using investigation and experimentation. This included military research into horse health and agricultural research into animal husbandry, land management, and crop production. This work along with the interest in controlling disease drove the development of an organized veterinarian profession in many European nations. The eighteenth century also saw a renewed interest in the relationship between animal and human health beyond what medicines and interventions worked in both populations. Different European countries experienced different levels of success in improving agricultural output, controlling disease, creating veterinary medical professionals, and integrating animal and human health in the 1700s.
Wilkinson, 10, 52, 88.
Schwabe, 155.
John Broad, "Cattle Plague in Eighteenth-Century England," *The Agricultural History Review* 31, no. 2 (1983): 104.
G. E. Fussell, "Science and Practice in Eighteenth-Century British Agriculture," *Agricultural History* 43, no. 1 (1969): 7.
CC Hannaway, "Veterinary Medicine and Rural Health Care in Pre-Revolutionary France," *Bulletin of the History of Medicine* 51, no. 3 (1977): 431-47.
Laurence B. McCullough and James Polk Morris, *Implications of History and Ethics to Medicine--Veterinary and Human* (College Station: Centennial Academic Assembly, Texas A & M University, 1978), 53.
Peter A. Koolmees, “Epizootic Diseases in the Netherlands 1713-2002: Veterinary Science, Agricultural Policy, and Public Response,” in *Healing the Herds: Disease, Livestock Economies, and the Globalization of Veterinary Medicine*, ed. Karen Brown and Daniel Gilfoyle (Athens: Ohio University Press, 2010), 19-40.

[8]Broad, 104.
C. Huygelen, "The Immunization of Cattle Against Rinderpest in Eighteenth-Century Europe," *Medical History* 41 no. 2 (1997): 183.

Christopher Columbus' second voyage in 1493, cattle served as animals of empire for both the Spanish and the British.[9] With few or no predators, no diseases, and plentiful sources of grasses, wild fruits, and roots, the lean, horned, and adaptable Spanish cattle became the most successful animal transferred to the Americas.[10] By the late sixteenth century, observers noted that ranch herds seemed to double in size every fifteenth months, and by 1600, meat became the cheapest food in the Spanish controlled American colonies.[11] The Spanish cattle population grew so much that "wild cattle roamed freely in inestimable quantities far beyond the colonists' horizons."[12] These animals served as colonist themselves, taking over the plains in what is now Mexico and Texas before Europeans moved into those territories.

The British also brought their own cattle with them to their American colonies, and while they required more care than Spanish cattle, they also thrived in the Americas.[13] At first, cattle often died in the winter and in Jamestown it was illegal to slaughter cattle from 1614 to 1627 due to their scarcity.[14] However, the British colonial cattle soon evolved into a hardy breed, and by the mid-seventeenth century, visitors observed large herds of English cattle across the colonies while Maryland colonist complained about wild cattle mixing with their tamed herds.[15] Just like Spanish cattle, British cattle acted as a force for colonization as colonists seized land to host their expanding herds and wild cattle

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[9]Alfred W. Crosby, *The Columbian Exchange: Biological and Cultural Consequences of 1492* (Westport, CN: Greenwood Press, 1972), 75.
Virginia DeJohn Anderson, *Creatures of Empire: How Domestic Animals Transformed Early America* (Oxford: Oxford University Press, 2004), 97.

[10]The Spanish successfully adapted the open ranching of Southern Iberia, which took advantage of large spaces and plentiful natural food supplies, in the Americas to create large ranches and take advantage of the fecundity of cattle. The large number of cattle created a surplus of cattle-based products in the colonies. Cattle products became vital to other colonial enterprises such as mining which relied on candles made from beef tallow and hides became a major export good for the Spanish colonies.
Crosby, *The Columbian Exchange*, 86-87.

[11]Ibid., 85-88.

[12]Ibid., 88.

[13]Alfred W. Crosby, *Germs, Seeds & Animals: Studies in Ecological History* (Armonk, NY: M.E. Sharpe, 1994), 33.

[14]James Frederic Smithcors, *The Veterinarian in America 1625 - 1975* (Santa Barbara: American Veterinary Publications, 1975), 21.

[15]Alfred W. Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900-1900* (Cambridge: Cambridge University Press, 1986), 179.

moved westerly to viable land.[16] The British cattle frontier expanded from the Atlantic coast to the North American grasslands before the human frontier.[17] For both the Spanish and the British, cattle overran the existing colonies and expanded to uncolonized land in search of new forging lands. This grew and expanded empires as herdsmen and farmers followed the cattle and colonized new territories in both North and South America.

Colonists knew that the large population of cattle could support disease, but the American colonies remained free of significant epizootic cattle diseases like rinderpest and enzootic cattle diseases like foot-and-mouth during the eighteenth century.[18] This may have been because few animals needed to be imported from Europe reducing the chance of importing diseased animals or that diseased animals died on the long trans-Atlantic voyage, it may have been because of the large grazing areas left few opportunities for disease to spread from animal to animal, or some other unknown factor may have prevented the spread of infection. As a result, the growth of the veterinary medical profession lagged behind the development of the profession in Europe. In the British colonies, the first records of a cow doctor date to the seventeenth century and the production of the first general guide to cattle disease for farmers began in 1710.[19] The Philadelphia Society for Promoting Agriculture began reporting animal diseases in the latter part of the eighteenth century and recognizing the importance of veterinary medical work at the start of the nineteenth century.[20] No veterinary schools, training programs, or organized professional groups formed at this time, but medical officials and some farmers began to see the value of veterinary medicine and to differentiate it from the work of farriers and other professions who carried for domesticated animals.

[16]Anderson, 97.
[17]Crosby, *Ecological Imperialism*, 179.
[18]Anderson, 188.
[19]Smithcors, 22, 36.
[20]Ibid., 50.

The Role of Farmers in American Culture and Politics

The development of the veterinary medical profession in the newly formed United States lagged behind its growth in European countries, but the young nation shared an interest in increased agricultural output. The country relied on farmers and livestock producers economically and they occupied a specialized place in political and cultural landscape. After the Revolutionary War, new markets opened to farmers as the country became self-reliant and continued to expand westward.[21] Agriculture literally and figuratively fed the nation with consumer products and economic wealth. During the transition from colony to country, agriculture became tied to the politics of land and the federal government. Many politicians recognized that they needed to create a system to turn public land private and to address the many overlapping land claims that existed.[22] However, the weak federal government had little power to enforce any land laws it created, and it offered little help to farmers outside of land laws.[23] Agriculture was a vital industry to the United States, but the status of the federal government meant that those in the field could not depend on the national government to create and enforce policy beneficial to farmers and livestock producers.

The federal government developed no agricultural related agencies to encourage innovation, research, or education during the period after the Revolutionary War, but farmers, farms, and livestock became a crucial part of the national cultural fabric. The British colonists had idealized agrarian life and the grazing herd as peaceful and idyllic.[24] This conceptualization of the farm and herd as pastoral haven carried on in the new nation and agricultural producers took on new significance politically and culturally. The yeoman farmer became the centerpiece of Jeffersonian democratic policy and thought of as the backbone of democracy and the country. Thomas Jefferson embraced cultivators as

[21]John T. Schlebecker, *Whereby We Thrive: A History of American Farming, 1607-1972* (Ames: Iowa State University Press, 1986), 71.
[22]Ibid., 57
[23]John Opie, *The Law of the Land: Two Hundred Years of American Farmland Policy* (Lincoln: University of Nebraska Press, 1987), 3
[24]Anderson, 77.

> the most valuable citizens. They are the most vigorous ,the most independent, the most virtuous, & they are tied to their country & wedded to it's liberty & interests by the most lasting bonds.[25]

Not all agreed with this political theory, but many across the new nation saw the farmer as integral to the American culture.[26] The farmer and livestock producer had a physical relationship with the land and a presumably independent spirit that created a connection with the developing concept of national identity. Jefferson believed that these individuals went off on their own to tame and work the soil wanting to be free and independent and therefore had the qualities most wanted in a citizen of the newly formed nation. They held a special place as representatives of the nation's spirit and its agricultural potential.

During the early nineteenth century, changes in technology like improved reapers and plows, quicker modes of transportation like railroad and canals, and the opening of more land in the west meant that fewer people provided more agricultural product and farming started to become more commercialized.[27] Even though fewer people engaged in agricultural work, the independent farmers continued to hold a cultural and political role in the nineteenth century. Jacksonian democracy policy focused on the independent cultivator as a representative of the independent spirit of the country. The concept of Manifest Destiny in the mid-nineteenth century also embraced individual farmers as settlers who unified the nation, claimed and tamed the west, and made it productive.[28] By the 1840s, farmers produced enough food and transported it swiftly enough to bring their goods to market across the country and even across the sea. During the decades before the Civil War, farmers experienced

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[25]Thomas Jefferson to John Jay, Paris, 23 August 1785, http://etext.virginia.edu/etcbin/toccer-new2?id=JefLett.sgm&images=images/modeng&data=/texts/english/modeng/parsed&tag=public&part=33&division=div1 (accessed March 05, 2013).

[26]PM Grant et al., "The Importance of Comprehensive Agricultural Education in Land-Grant Institutions: A Historical Perspective," *Journal of Animal Science* 78, no. 6 (2000), 1685.
Opie, 193.

[27]Schlebecker, *Whereby We Thrive*, 71.

[28]United States Census Office, *Tenth Census*, XXVII – XXIX.

increasing sales to growing urban centers in the United States and in Europe.[29] Through their role as producers and settlers, farmers had anchored themselves as a cornerstone of American political, cultural, and economic identity during the Antebellum Era.

The relationship between the federal government and farmers grew during the first half of the nineteenth century. Both the House and the Senate created agriculture committees in the 1820s to handle the problems and grievances of the agriculture community.[30] While dealing with land disputes, tariffs, and issues of trade, the committees had limited legislative agendas and agricultural producers remained largely independent from federal law and regulations.[31] Recognizing the importance of learning more about the American agricultural landscape, the congressional committees authorized funding for the collection of agricultural data. The agricultural division of the patent office collected and distributed agricultural information including seed samples and statistical information in the 1840s and 1850s.[32] This marked the federal government's first agricultural research and laid the groundwork for a federal agriculture agency.

Though no federal agriculture agency, research institute, or college existed in the Antebellum Era, an interest in agricultural information, research, and education by some farmers, politicians, and academics grew during the mid-nineteenth century. Farmers began to organize professional groups and farm journals to disseminate information. A number of regional journals spread information about new

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[29]Schlebecker, *Whereby We Thrive*, 71.
Alan L. Olmstead and Paul Webb Rhode, *Creating Abundance: Biological Innovation and American Agricultural Development* (New York: Cambridge University Press, 2008), 317.

[30]House Committee on Agriculture, "Committee History," Unites States House of Representatives, http://agriculture.house.gov/singlepages.aspx?NewsID=1265&LSBID=23|64|65 (accessed March 15, 2012).
"Chapter 1: The Committee is Created: 1825-1857," United States Government Printing Office, http://www.access.gpo.gov/congress/senate/sen_agriculture/ch1.html (accessed March 15, 2012).

[31]"Chapter 1: The Committee is Created: 1825-1857."

[32]Gladys L. Baker et al., *Century of Service: The First 100 Years of the United States Department of Agriculture* (Washington, D.C.: Centennial Committee, U.S. Dept. of Agriculture, 1963), 5-7.
Arthur A. Daemmrich and Joanna Radin, *Perspectives on Risk and Regulation: The FDA at 100* (Philadelphia: Chemical Heritage Foundation, 2007), 15.

fertilizers and tools along with information about crop and animal care.[33] Local farm organizations and journals also worked with researchers at colleges who had begun applying science to agricultural issues such as soil chemistry and fertilizer. Farming journals began featuring scientific journalism in the 1840s resulting in many publishers, writers, and readers placing greater value on applied science in the agricultural field.[34] In order to expand the understanding and use of applied science, many agriculture journals and organizations advocated for agriculture education to be included as part of general college education and encouraged farmers to attend college. They hoped this would elevate the farmer, the backbone of the democracy, into a professional class with training in the classics and scientific agricultural techniques.[35] Many advocates for agriculture education also wanted to increase production and decrease the amount of work needed in agricultural labor. They hoped to achieve this through scientific research into higher production and new technology.[36] As an important part of the American economy, supporters of agriculture institutes argued that more knowledge about national practices by producers and research into how to increase yields would benefit the nation economically and culturally.

The desire for a federal system to share and develop agricultural knowledge led to attempts to create agricultural schools and agencies in the mid-nineteenth century. Congress passed a proposal in 1859 to set aside federal public land in each state to create colleges that taught agriculture and mechanics along with a more traditional course of science and humanities. President Buchanan vetoed the bill not because he objected to agricultural education, but due to concerns about the use of public land and the constitutionality of the bill.[37] To avoid these issues, some wanted to use the money donated to the United States by James Smithson to develop a federal agriculture college and once the

[33]Donald B. Marti, "Agricultural Journalism and the Diffusion of Knowledge: The First Half-Century in America," *Agricultural History* 54, no. 1 (1980): 30.
[34]Ibid., 31 – 32.
[35]Grant et al., 1685.
[36]Abraham Lincoln, “Lincoln's Milwaukee Speech,” (address, Wisconsin State Agricultural Society, Milwaukee, WI, September 30, 1859), http://www.nal.usda.gov/lincolns-milwaukee-speech (accessed March 07, 2013).
Grant et al.
[37]Ibid., 1686.

Smithsonian became a research institution, some politicians wanted it to focus its research on farming and livestock. Senator Stephen A. Douglas even attempted to turn the Smithsonian into a department of agriculture shortly before the Civil War.[38] Political and popular support for federally sponsored agriculture education and research existed, but concerns about the role and reach of the federal government prevented the passage of any acts or laws on the subject in the 1850s.

As Southern states seceded in 1860 and 1861 and Democrat southern congressmen left the House and Senate, Republicans pushed previously contentious legislative initiatives through Congress. In 1862, a number of land and agriculture acts were enacted including the Homestead Act, the Transcontinental Railroad Act, the Morrill Land Grant Act, and the Agriculture Act.[39] Lincoln believed that

> farmers, being the most numerous class, it follows that their interest is the largest interest. It also follows that interest is most worthy of all to be cherished and cultivated--that if there be inevitable conflict between that interest and any other, that other should yield.[40]

He also thought that reading and access to information about agricultural research would improve the economy of the country by increasing production while decreasing the amount of land used and work effort.[41] By passing laws that advanced an agrarian agenda, Lincoln and the Congress sought to improve the dominate form of industry in the United States and insure that the producers knew about

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[38]Paul Israel, "[Review of] The Papers of Joseph Henry. Vol. 7, January 1847-December 1849," *Technology and Culture* 43, no. 4 (2002): 792.

[39]Though the Morrill Land Grant Act and the Agriculture Act applied directly to agriculture, the other two major acts of 1862 also changed agricultural practices in the United States. The Homestead Act opened more land to farming and ranching west of the Mississippi and was designed to encourage small farmers, the yeoman farmers of Jeffersonian democracy, to claim land. By 1934, 10% of all United States land had been turned over to individuals through the act. The Transcontinental Railroad Act that created national railroad systems also impacted agriculture by providing a faster, more effective way to move goods to market, opening new markets to farmers.
The National Archives, "The Homestead Act of 1862," The National Archives, http://www.archives.gov/education/lessons/homestead-act/ (accessed March 08, 2013).
Wayne D. Rasmussen, and Gladys L. Baker, *The Department of Agriculture* (New York: Praeger Publishers, 1972), 3

[40]Lincoln.

[41]Ibid.

the most recent advancements in the field. Through this legislation, they hoped to create educated yeoman producers who could efficiently grow and transport their goods across the United States. Lincoln's administration and most Republican politicians accepted the idea of farmers as the bedrock of the country and prioritized legislation that expanded available farmland and the agricultural potential of the nation.

Agricultural Research and its Impact in the Nineteenth Century

The Agriculture Act created the United States Department of Agriculture.[42] Based on the work of the agricultural division of the patent office, the department was originally charged with collecting, arranging, and publishing agricultural statistics and information, answering farmer questions, and performing chemical analysis.[43] The department aimed to improve agriculture in the United States through these functions. In addition to absorbing the agricultural work of the patent office, the new department also acquired all of the scientific literature on farming compiled by the patent office. By 1864, the USDA had appropriated $4,000 for a library and laboratory. A year later they received land in the capitol for an experimental farm, and by 1867, Congress appropriated $100,000 for a permanent office building.[44] As the repository of the nation's knowledge about agriculture, the newly formed Department of Agriculture served not only as a space to house this information, but also as a laboratory for testing the agricultural techniques it collected and distributed. The organization quickly moved past its initial charge of collecting and sharing agricultural information and basic soil analysis, growing to include active agricultural research.

Once established, the USDA embraced applied science and the scientific method to test the

[42]Rasmussen and Baker, 3.
[43]Baker, 4.
[44]National Agriculture Library History, "National Agriculture Library Timeline," National Agriculture Library, http://www.nal.usda.gov/nal-history (accessed March 08, 2013).
Baker, 15 – 16, 18.

farming information and tools they gathered in order to determine the best agricultural techniques.[45] The department then shared this information with the public through publications and education.[46] The Department of Agriculture became one of the first federal departments to extensively use scientific research to fulfill its charge.[47] Just like the college researchers and agricultural journalists that used science to evaluate farm products, USDA researchers utilized chemistry, botany, animal husbandry, and mechanical sciences to improve soil, manures, plant and animal breeds, and agricultural technology.[48] Those working at the Department of Agriculture saw science as a tool to accomplish the department's goal of improving agriculture in the United States.

The other law passed by the 1862 Congress aimed at improve agricultural science and technology along with improving agricultural education was the Morrill Land Grant Act. Nearly identical to the law that President Buchanan vetoed in 1859, it provided federal land for state colleges teaching the agricultural and the mechanical arts, which fulfilled the desire of farmers, academics, and politicians to further agricultural education. The state used its apportioned federal land for the college

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[45]Some of the first projects conducted at the USDA involved developing replacements for Southern crops such as cotton that the North had trouble growing or purchasing. The Civil War and the necessity of certain crops helped turn the new Department of Agriculture into a research institution as soon as it was established
Ibid., 15.

[46]Rasmussen and Baker, 6.

[47]Other departments and government agencies followed suit as the federal government expanded the role of science in the United States government. After the Civil War, the federal government employed large numbers of naturalists and scientists to work on surveys of national resources and conduct research on areas such as fishery, geology, and botany. The supporters of this work used claims of economic importance and national culture just like those who supported federal agriculture research. During the Gilded Age, Washington D.C. turned into the hub of the scientific community in the United States as the federal government employed more scientists and created space for research institutes including a USDA research institute and library on the national mall. The American public also embraced scientific research and learning in the decades after the Civil War leading to the creation of a number of local and regional scientific societies. These voluntary organizations contributed to the larger national research network and the growth of science and its role in the life of Americans during the nineteenth century.
Philip J. Pauly, *Biologists and the Promise of American Life: from Meriwether Lewis to Alfred Kinsey* (Princeton, N.J.: Princeton University Press, 2000), 51–57.
Vivian Wiser, "Public Policy and USDA Science 1897-1913," in *The United States Department of Agriculture in Historical Perspective*, ed. Alan I. Marcus and Richard Lowitt (Washington, D.C.: Agricultural History Society, 1991), 30.
Daniel Goldstein, "Outposts of Science: The Knowledge Trade and the Expansion of Scientific Community in Post-Civil War America" *Isis* 99 (1999): 520 – 523.

[48]Lincoln.
Baker, 16 – 17, 19 – 20.

itself or sold the land and used the proceeds to fund the college.[49] In 1890 a second Morrill Land Grant Act provided money for schools in Southern states requiring either equal access for African Americans or the creation of separate black land-grant schools.[50] In addition, the new law provided annual subsidies to land-grant colleges to teach agriculture and the mechanical arts.[51] The initial land-grant act and the subsequent act expanded access to education across the United States in the second half of the nineteenth century and firmly established a space for agricultural research and education at American colleges.

The development of the Department of Agriculture and the land-grant universities in the middle of the nineteenth century established a national research and education network aimed at improving the country's agricultural economy through scientific farming and livestock management. The 1887 Hatch Act created a state-federal research cooperative that extended the relationship between land-grant universities and the USDA. The universities received money from the government to establish agricultural experiment stations that served farmers, the university, and the Department of Agriculture.[52] Designed to conduct research on animal care and livestock production along with research on crops, soil, and vegetation and to disseminate the results of those experiments, tension over

[49]Grant et al., 1686.

[50]In the late nineteenth century, some states, mostly former Confederate states, refused to admit black students to their land-grant universities. The provision of separate schools for African Americans led to the development of 19 land-grant universities for black students now commonly referred to as public historically black colleges and universities. The 1890 Morrill Act opened access to agricultural education and knowledge to black farmers as intended in the original Morrill Act. It also served as an example of the growing doctrine of separate but equal upheld by the 1896 Plessy v. Ferguson Supreme Court decision.
Stephen Provasnik, Linda L. Shafer, and Thomas D. Snyder, *Historically Black Colleges and Universities, 1976 to 2001* (Washington, DC: National Center for Education Statistics, U.S. Dept. of Education, Institute of Education Sciences, 2004), http://purl.access.gpo.gov/GPO/LPS54090 (accessed March 10, 2013), 1.
Racial Discrimination by Colleges Restricted, U.S. Code 7 (1890), § 323, http://www.law.cornell.edu/uscode/text/7/323 (accessed March 10, 2013).
"A Condensed History of American Agriculture 1776-1999," The United States Department of Agriculture, http://www.usda.gov/documents/timeline.pdf (accessed March 12, 2013).

[51]Baker, 40.

[52] Lou Ferleger, "Uplifting American Agriculture," in *The United States Department of Agriculture in Historical Perspective*, ed. Alan I. Marcus and Richard Lowitt (Washington, D.C.: Agricultural History Society, 1991), 7.

the role of the experiment stations existed from the start of the program.[53] Local farmers and the associated land-grant universities wanted control over the projects and research conducted at state agricultural research stations while the USDA wanted the experiment stations to answer to the federal Office of Experimental Stations within the department.[54] Agricultural experiment stations created under the Hatch Act grew the network of state-federal agricultural research and information, but also exposed the potential problems of this collaboration. Cultivators, livestock owners, university researchers, state agriculture officials, and federal agriculture officials had to negotiate their research goals and priorities to create a functioning experimentation network that addressed the pressing needs of all parties interested in scientific farming.

The interaction of land-grant universities and farmers grew during the early twentieth century due to the passage of the Smith-Lever Act in 1914. The act created the national cooperative extension services, an educational arm for the USDA, that built on the existing agricultural experiment station network at universities. In addition to publishing the results of research, the extension service shared information on any topic related to farming, livestock raising, and home economics including nutrition, youth activities, and resource management. Like the agricultural research stations, a federal extension service guided the state extension services, but the state services acted independently to respond to the needs of the community.[55] The Smith-Lever Act and the establishment of the extension service network expanded the relationship between the federal government, the land-grant university system, and individuals.

Legislation and government actions along with the development of an agricultural research and educational network, new technology and farming techniques, and increased consumer demand drove

[53]C. M. Jones, *One Hundred Years of Inquiry and Innovation: An Illustrated History of the American Dairy Science Association* (Long Prairie, MN: Banta, 2006), 8.
[54]Ferleger, 15.
[55]Daniel L. Merkel, "The Federal Extension Process," *Rangelands* 7, no. 4 (1985): 167.

agricultural production in the second half of the nineteenth century and early twentieth century. Between 1850 and 1890, more than 3 million new farms developed in the United States as people took advantage of the Homestead Act and other provisions that opened new land to settlers.[56] At the same time, a growing population with increased urbanization and industrialization opened new markets for food products and other agricultural goods. The development of major railroad lines made it easier to ship goods to these domestic markets and improved trans-Atlantic transportation turned Europe into an expanding market for American agriculture.[57] More market space made it possible for farmers to generate enough profit to invest in the new technology and scientific advances developed and popularized through the USDA and land-grant colleges with the promise to increase yield and increased profitability.[58] By 1890, farmers owned an estimated $494 million in implements and machinery to

[56]By the 1890 agricultural census, the number of farms created began to slow from the peak of expansion from the 1850s through the1870s. During those decades the number of farms increased while the average size of a farm decreased (an indication that the intentions of those interested in developing yeoman farmers while decreasing the importance of plantation farming had born fruit). In the 1880s, new farms continued to appear in many states west of the Mississippi or in the South, but older states in the North Atlantic area like New York and Pennsylvania saw a decrease in the number of farms as landowners consolidated their holdings or sold their land. Agriculture remained an important economy in the North Atlantic, but may have shrunk due to industrialization, increased urbanization, and the ability to rely on agricultural goods from other areas of the country.
United States Census Office, *Reports on the Statistics of Agriculture in the United States Agriculture in the United States at the Eleventh Census: 1890* (Washington D.C.: Government Printing Office, 1896) http://www.agcensus.usda.gov/Publications/Historical_Publications/1890/1890a_v5-01.pdf (accessed March 12, 2013), 1-3, 84.

[57]Schlebecker, *Whereby We Thrive*, 71.

[58]Not all farmers wanted to transition to scientific farming. These farmers often thought that researchers at the Department of Agriculture, universities, and experiment stations had no experience practicing agriculture in the real world and that science was no match for experience. Many also thought that these advances in technology benefited large farmers who had the money to invest in new equipment, breeds, seeds, or fertilizers rather than the small farmer who was the intended target of the 1862 agricultural related legislation. In addition, there was no guarantee that adopting the suggested practices of the USDA and universities led to better yields and more profit though that was the intended goal. Since the mid-twentieth century, some historians have questioned the worth of the research conducted by the Department of Agriculture and its value to the agricultural economy of the United States claiming that programs and policies based on this research actually did not benefit farmers and livestock owners or increase productivity. Even with opposition by some farmers and regardless of the argument over the worth of USDA research-based policy, the “scientific” agriculture developed by the Department of Agriculture and the research network including land-grant colleges and experiment stations had an impact on how most American farmers and livestock owners managed their land, cultivated crops, and tended to their animals and fundamentally altered the practice of agriculture in the country during the late nineteenth and early twentieth centuries.
Schlebecker, *Whereby We Thrive*, 151.
M. Elizabeth Sanders, *Roots of Reform: Farmers, Workers, and the American State, 1877-1917* (Chicago: University of Chicago Press, 1999), 322.
Charles E. Rosenberg, "Rationalization and Reality in the Shaping of American Agricultural Research, 1875-1914,"

help them farm and tend to livestock.[59] Engineering and science had become part of the day to day life on many American farms in the pursuit of more efficient and productive farming to answer the demand of domestic and foreign markets.

As the agricultural sector grew in the late nineteenth century, so did farmers' and livestock owners' interactions with government agencies. Historically cultivators held symbolic meaning in the nation, dating back to the colonial era. However, as discussed earlier in the chapter, they had little interaction with the early United States federal government. Throughout the nineteenth century, Congress developed agricultural committees and in many communities, agricultural societies started in part to lobby for the interest of cultivators. The development of the Homestead Act, the Department of Agriculture, and other agriculture related laws in the mid-century marked a dramatic increase in the contact between most farmers and the United States government. By the late nineteenth and early twentieth centuries, most people in rural populations, especially those in areas with extensive homesteading and public land, dealt with the United States Army, the Bureau of Land Management, the Bureau of Indian Affairs, and the Fish and Wildlife Services, along with officials from the state and local agricultural departments, research bureaus, and extension services. Those in rural areas had significant contact with the state and it played a defining role in their lives. These people often actively engaged with these governmental agencies, sometimes in cooperation and sometimes in resistance, negotiating policy and practices. New local and national groups advocating for the rights of farmers and livestock producers, particularly independent farmers hoping to keep their autonomy, developed in the late nineteenth century as producers attempted to gain political power to shape the agencies and

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Social Studies of Science 7, no. 4 (1977): 401-422.

"The Meaning of the Word "Science"," *Hoard's Dairyman* 34, no. 24 (1903): 549.

Bruce L. Gardner, *American Agriculture in the Twentieth Century: How it Flourished and What it Cost* (Cambridge, Mass: Harvard University Press, 2002), 8-9.

Susan D. Jones, *Valuing Animals: Veterinarians and Their Patients in Modern America* (Baltimore: Johns Hopkins University Press, 2003), 6.

[59]*Reports on the Statistics of Agriculture at the Eleventh Census,* 85.

policies affecting them.[60] Many such as the Patrons of Husbandry (commonly known as the Grange), the Texas and Southwestern Cattle Raisers Association (TSCRA), and the Farmers' Alliance developed as fraternal organizations or groups created to police rural communities by preventing land jumping and livestock rustling. They then grew in the late nineteenth century into national organizations or joined with other regional groups to form national farming and livestock associations. The large farming interest groups encouraged political action among their members both at the local level and the federal level leading to the implementation of Granger laws in the 1870s and the development of the Populist Party with its agrarian agenda.[61] Though the Populist Party faced defeat at the polls in the 1890s, many members joined the Democratic Party and brought their agricultural policies with them.[62] Through professional organizations, Granger laws, and by having their policy added to a major party's platform, agricultural producers gained political power and used it to impact the laws and policies that they dealt with on the farm and on the range. By the start of the twentieth century, cultivators held significant political power along with cultural and economic power.

One of the growing agriculture sectors in the second half of the nineteenth century was livestock. By 1900, over 1.5 million livestock farms existed, and they represented the largest number of farms by source of income.[63] While the number of swine, sheep, goats, and poultry on American farms

[60]The focus on independent farmers in the post-Civil War era continued the trend of focusing on the yeoman farmer as the backbone of America.
Catherine McNicol Stock and Robert D. Johnston, eds., *The Countryside in the Age of the Modern State: Political Histories of Rural America* (Ithaca: Cornell University Press, 2001), 5-6.

[61]Farmers and livestock owners never constituted one voting bloc and organization like the Grange and the Populist Party did not have the support of all of those in the agricultural community. However, these two groups were some of the larger, more politically active groups and serve as examples of how agricultural organization tried to impact policy and politics to their benefit in the late nineteenth century. These two groups and others did not necessarily advocating for the same policies since they represented different types of producers from different areas of the country. However, they all wanted farmers and livestock owners to be more involved in the political process and have producers participate in shaping local, state, and federal policies and programs that affected their members.
Sanders, 105-108, 111-118.

[62]Ibid., 148-149.

[63]United States Census Office, *Census Reports Volume V, Twelfth Census of the United States, Taken in the Year 1900, Agriculture Part I* (Washington D.C.: United States Government Printing Office, 1901), http://www.agcensus.usda.gov/Publications/Historical_Publications/1900/1900_Farms_Livestock/33398096v5ch1.pdf

and ranches increased, cattle still led all livestock in number and value at the end of the nineteenth century with an estimated 67.8 million heads of cattle worth nearly $1.5 billion nationwide.[64] Ranchers and farmers moving into the west after the Civil War rounded up the wild cattle, brought cattle with them, and imported European breeds to meet the demand of Americans who began consuming more meat and dairy products.[65] Better transportation methods and manufacturing of milk-based products brought better cuts of meat, higher quality butter, and different types of cheeses to industrialized areas of the country and whetted the appetite of the American public for these goods.[66] Cattle owners began moving large quantities of animals across the country in order to reach rail heads in the Midwest that provided access to markets and slaughterhouses across the country.

Cattle Disease and the Establishment of the Bureau of Animal Industry

As ranchers and cowboys drove their animals from Southern states to the Northern Plains area, epizootic disease followed in their wake.[67] Often reported as killing 90% to 100% of local cattle, the disease commonly went by the name Texas fever due to suspicion that it was related to the movement of Texas cattle to the plains.[68] In the 1850s and 1860s, local cattle owners in Missouri and Kansas turned away cowboys and their animals to protect their herds from infection, creating informal local quarantines.[69] In 1867, Kansas established a quarantine line to prevent the movement of Texas cattle into parts of the state, but many cattle owners from Texas and Kansas and towns such as Dodge City

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(accessed March 15, 2013), cl.

[64]*Twelfth Census of the United States Agriculture Part I*, clvii, plate 19.

[65]John T. Schlebecker, *Cattle Raising on the Plains, 1900-1961* (Lincoln: University of Nebraska Press, 1963) 3-11. Olmstead and Rhode, 327.

[66]Schlebecker, *Cattle Raising*, 10-11.
Twelfth Census of the United States Agriculture Part I, clxv – clxvi.

[67]Schlebecker, *Cattle Raising*, 5-6.

[68]Baker, 32.

[69]Neal F. Black, *Animal Health: A Century of Progress* (Richmond, VA: United States Animal Health Association, 1996), http://portals5.gomembers.com/Portals/6/AnimalHealth-ACenturyOfProgress.pdf (accessed March 12, 2013), 3. Claire Strom, "Texas Fever and the Dispossession of the Southern Yeoman Farmer," *The Journal of Southern History* 66, no. 1 (2000): 53.

fought the quarantine in order to participate in the lucrative beef trade.[70] Though the quarantine dealt with the movement of animals across state lines, the federal government did not act to enforce or eliminate the quarantine instead allowing Kansas to control the movement of cattle within its own borders. While the federal government and the Department of Agriculture neither created nor enforced any laws or regulations preventing the movement of Texas cattle in the middle of the nineteenth century, Congress did establish a commission to investigate cattle diseases through the Treasury department in 1868. While not part of the agriculture department, this commission followed the established protocol of the USDA by using scientific research to try and identify the cause of cattle diseases in the United States and a possible solution to the problem.[71] The researcher in charge observed cattle across the South and mapped the pathology of the disease leading to the differentiation of Texas fever from contagious bovine pleuropneumonia and a better understanding of the distribution of the disease.[72] While the initial investigation clarified medical understanding of Texas fever, the causal agent remained unknown in the 1870s, and the federal government continued to allow local and state governments to dictate disease control measures.

Cattle disease not only affected domestic beef markets but foreign ones as well. In addition to a growing domestic market, American beef also found an audience in Britain due to a ban on imports from European countries with outbreaks of contagious bovine pleuropneumonia and the depletion of

[70]Many of those who defied the quarantine believed longhorns could not be the source of the disease since they showed no evidence of it.
Tamara Miner Haygood, "Cows, Ticks, and Disease: A Medical Interpretation of the Southern Cattle Industry," *The Journal of Southern History* 52, no. 4 (1986): 552.

[71]Susan D. Jones, 29.
Smithcors, 13.

[72]A number of researchers proposed possible causes of Texas fever including a fungus or parasite that the cattle brought with them on their hides or in their droppings as they moved north. Even without the framework of germ theory, many researchers thought that an outside agent carried by exposed Southern cattle caused the fever and they attempted to isolate and identify the agent using experimental methods.
Baker, 19.
Haygood, 553 – 555.

British herds by foot-and-mouth disease in the 1860s.[73] Having disease-free cattle and meat became an important selling point for American meat on the international market and created an economic advantage for cattle owners who wanted to expand beef sales to Britain. In order to maintain a competitive advantage over cattle from continental Europe and Argentina, American cattle had to remain free of cattle plague or any other infection deemed epizootic by a foreign country. The differentiation of pleuropneumonia and Texas fever led to awareness that an epizootic of contagious bovine pleuropneumonia existed during the late 1870s. As a result, the British banned cattle and sheep from both the United States and Canada in order to protect their domestic herds.[74] This economically harmful ban and the potentially devastating effects of the epizootic disease on the domestic cattle population pushed the federal government to enact regulations to halt the spread of pleuropneumonia.[75] The power for the USDA to impose disease control and eradication efforts came when Congress enacted the Act of May 29, 1884 that created the Bureau of Animal Industry and gave it authority to regulate the livestock industry to prevent the spread of disease. This marked not only the creation of the Department of Agriculture's first bureau, but also gave the department new regulatory power and extended government power of the agricultural industry.[76] The federal government granted this police

[73]William David Zimmerman, "Live Cattle Export Trade between United States and Great Britain, 1868-1885," *Agricultural History* 36, no. 1 (1962): 46-47.
Abigail Woods, *A Manufactured Plague: The History of Foot-and-Mouth Disease in Britain* (London: Earthscan, 2004), 10.

[74]Britain was not the only country to ban American meat due to disease concern in the late nineteenth century. The German government banned American pork due to lack of inspection, the high rate of trichinosis in the American swine population, and also protectionist political policy.
Suellen Hoy and Walter Nugent, "Public Health or Protectionism?: The German-American Pork War, 1880-1891," *Bulletin of the History of Medicine* 63: 198.

[75]Susan D. Jones, 29.

[76]The USDA established a veterinary division the year before and had conducted research into animal health and disease as part of it agricultural research mission, but the Bureau of Animal Industry marked the creation of the Department of Agriculture's first bureau that specialized in one particular area of research and the power to regulate that area. While the Congress gave the bureau power to inspect, test, and prohibit the movement of diseased cattle, it retained the right to designate a disease as an epizootic concern. In order to create a federal control program for an animal disease, Congress had to amend the Act of May 29, 1884 to include that disease as one the BAI could regulate for and then Congress had to approve the funds for the program. This gave ultimate control of what constituted an epizootic disease that threatened American agriculture and the amount of money spent on its eradication or control to Congress rather than the Bureau of Animal Industry and prevented the USDA from acting unilaterally when a disease first emerged as a potential one to

power to the BAI not in the name of public health since the disease did not spread to humans but for economic reasons.[77] While the state invoked the same legal right to impose quarantines, sanitation requirements, or vaccinations as it did for human diseases, the rational for implementing regulations stemmed from the desire to protect the agricultural economy rather than a population as it did in human public health.

The contagious bovine pleuropneumonia epizootic may have been the catalyst for the creation of the Bureau of Animal Industry, but several other factors also impacted its establishment including the changing role of veterinarians, the development of germ theory, and increased interest in the relationship of human and animal health. Even before the establishment of the BAI, officials at the USDA and many livestock owners wanted to eradicate animal diseases such as glanders and Texas fever. This desire to control epizootics created a place for veterinarians to assert their authority as experts. Before the late nineteenth century, most people perceived American veterinarians to be uneducated horse doctors who had no specialized skills that differentiated them from livestock owners who cared for their own animals.[78] Very few veterinary medical schools existed and most states required no licensing or requirements for veterinarians, so many farmers saw no reason to spend money on hiring a person who had no more training or experience than themselves.[79] In order to combat this perception during the nineteenth century, veterinarians tried to differentiate themselves by equating their work with science and by tying together animal and human medical practices. In his popular 1851

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control through a federal program.
Baker, 22-23.
Charles Brannan to Sam Rayburn, 28 May 1951, RG16, Box 1947-1951, File Legislation 1-1(22), National Archives.

[77]Not all veterinarians wanted to establish a bureau or institute to study and eliminate animal diseases for economic reasons. One veterinarian, Alexandre Liautard, one the most prominent veterinarians of the late nineteenth century advocated for including any animal disease research group as part of the National Board of Health due to his belief that agricultural interest and economics should not dictate animal disease research and control. However most veterinarians in the USDA including the first BAI chief, Daniel Salmon, fought to include the bureau in the USDA since they thought the primary focus of veterinary medicine was to maintain the health of economically valuable livestock like cattle, swine, and horses. Susan D. Jones, 16, 29-30.

[78]Ibid., 12.

[79]Ibid., 14-15.

book, *The American Cattle Doctor*, George Dadd, a medical doctor who worked as a practicing veterinarian, railed against the use of heroic medicine on animals and asserted that "a better day is dawning; veterinary information is loudly called for – demanded; and the farmer will have it . . . the very same paths that lead to a knowledge of the diseases of man lead also to a knowledge of those of brutes."[80] The book explicitly linked veterinary medicine with science and human medicine and prioritized science-based animal medicine as better than existing practices used by many veterinarians and farriers.[81] After the creation of the Department of Agriculture and the development of its culture of scientific study, the tie between veterinary medicine and science became stronger as administrators hired scientifically focused veterinary medical staff for the new department.[82] Many of the veterinary medical researchers in the USDA trained in Europe since America lacked veterinary schools. In the 1870s and 1880s, a number of veterinarians who worked in laboratories of Pasteur, Lister, and Koch were hired by the department to research animal health issues including animal diseases.[83] These veterinarians believed that science and research held the key to controlling animal diseases and that animal medicine needed scientifically trained professionals. They asserted that eradicating a cattle disease like Texas fever required specialized professionals who had advanced knowledge in fields such

[80]The American Cattle Doctor was aimed not at veterinarians nor did it necessarily advocate hiring them. Dadd designed the book to supply farmers with veterinary knowledge so they could treat their own animals rather than rely on unregulated animal medical practitioners. With very few medically trained veterinarians practicing in the United States, he wanted livestock owners to be able to care for their animals with the level of knowledge and attention that he thought all veterinarians should have.
George H. Dadd, *The American Cattle Doctor: Containing the Necessary Information for Preserving the Health and Curing the Diseases of Oxen, Cows, Sheep, and Swine, with a Great Variety of Original Recipes, and Valuable Information in Reference to Farm and Dairy Management* (New York: Orange Judd, 1851), 10.

[81]Smithcors, 63.

[82]Debates over experimental medicine and germ theory and their application in medicine also occurred among physicians in the mid and late nineteenth century. Just like veterinarians at the time, some American physicians went to Europe for their training and upon their return translated and disseminated literature from European physicians. In the human health medical community the use of experimental science had its supporters and critics as did the concept of germ theory. In the mid and late nineteenth century, some physicians embraced these concepts and saw them as a way to develop new treatments while other physicians worried that germ theory oversimplified the practice of medicine.
John Harley Warner, *The Therapeutic Perspective: Medical Practice, Knowledge, and Identity in America, 1820-1885* (Cambridge, MA: Harvard University Press, 1986), 185-187, 278-281.
Susan D. Jones, 29.

[83]Susan D. Jones, 28

as pathology, epidemiology, medicine, and public health beyond what a farmer experienced day-to-day with his or her livestock. Through epizootic disease, veterinarians carved a space for themselves as guardians of animal health and essential to maintaining a healthy herd.

The Department of Agriculture veterinarians who trained in Europe not only shaped the development of the Bureau of Animal Industry by linking scientific research and animal health, but also through their acceptance of germ theory and disseminating information about it in the United States. In the late nineteenth century, the concept of germ theory was still being tested and the details of how germs from outside the body caused diseases were being investigated.[84] The theory faced opposition from many veterinarians in the United States in the 1870s and 1880s but enjoyed strong support from most veterinarians in the USDA since they had trained with scientists who focused their research on proving germs caused diseases. These veterinary medicine researchers guided the department towards scientific research of animal disease based on the causal framework of germs and hired other researchers who believed in germ theory, scientific veterinary medicine, and laboratory work.[85] This made the Department of Agriculture a hub of germ theory-based research and education. Not only did USDA veterinarians encourage experimental research to study the cause of animal diseases, but they also translated and published articles about the concept of germ theory in veterinary medicine journals and agricultural bulletins.[86] This spread the idea of germ theory in the veterinary medical and agricultural communities, increasing its acceptance by both veterinarians and livestock owners at the end of the nineteenth century and the early twentieth century.

With the development of veterinary medical science, the growing acceptance of germ theory, and the increasing consumption of animal products, many researchers, producers, and consumers grew concerned about the relationship between the health of animals and the health of the items they

[84]Robert William Reid, *Microbes and Men* (New York: Saturday Review Press, 1975), 70-88.
[85]Susan D. Jones, 29.
[86]Ibid., 28

produced. In the mid-nineteenth century, some American veterinary medicine practitioners like Dadd had already connected the study of animal and human health and advocated that the bodies and diseases of the two populations fell under the same sets of knowledge. European trained veterinarians extended this connection later in the century by using the same experimental principles and theories used to study human health to study animal health. The concept of germ theory and the idea that germ spread from one sick individual to another raised the possibility that animals passed along germs to humans through consumable items and contact. This created a public health reason to control livestock diseases and also created a foothold for veterinarians to participate in the medical field.

By the early twentieth century, most of the American public thought foodborne illnesses resulted from eating meat or dairy products from sick animals rather than as a result of a contaminate gained during production, transportation, or storage.[87] This sparked demand for animal-based products from certified "healthy" livestock. Consumers wanted producers, public health advocates, researchers, and government officials to define a healthy animal and its products through law and regulation to ensure they knew that the animal goods they ate or used were disease-free.[88] Just as European markets had closed to American cattle, swine, and sheep due to disease in the 1880s, so did domestic markets in the following decades as cities and states began to regulate animal products such as milk and meat.[89] This drove interest in disease control by livestock owners as the economics of healthy cattle increased and led to greater reliance on veterinarians to care for their livestock.[90] By eliminating disease in livestock animals, veterinarians staked a claim as guardians of human health. They perceived

[87]Ibid., 63
[88]Ibid., 64.
[89]Ibid., 65.
Schlebecker, *Whereby We Thrive*, 272.
[90]Professionalization of veterinary medicine greatly increased in the late nineteenth century leading to the establishment of more public veterinary medical schools and licensing requirements as veterinarians were perceived as critical to animal care by more livestock owners.
Susan D. Jones 14-15.
Smithcors, 137.

themselves as protecting both the economic and public health of the nation through their work controlling animal diseases.[91] The desire to control human health through animal disease control combined together two different reasons for controlling livestock diseases, economics and public health, and pushed the Bureau of Animal Industry past its original focus of eradicating animal diseases for economic reasons.

Federal Cattle Disease Eradication Programs in the Late Nineteenth and Early Twentieth Centuries

The use of scientific veterinary medicine, germ theory, and concerns about economics and public health impacted how health officials at the federal and state level and cattle owners dealt with contagious bovine pleuropneumonia, Texas fever, and bovine tuberculosis in the late nineteenth and early twentieth centuries. The method of investigation, control, and cooperation for these three cattle diseases set the standard of how the Department of Agriculture dealt with other cattle diseases in the twentieth century. As the disease that sparked the creation of the BAI, contagious bovine pleuropneumonia became one of the first diseases the bureau tried to control.[92] The bureau relied on traditional methods of quarantine and treatment in order to prevent it from spreading in the United States. By having the power to prevent the movement of diseased cattle and inspect export cattle, researchers and federal officials hoped to curb the epizootic and restore cattle trade to Britain. However, these methods proved ineffectual and the bureau called upon Congress to enact another traditional

[91]Susan D. Jones, 16.

[92]Caused by the bacteria *Mycoplasma mycoides mycoides*, acute cases of contagious bovine pleuropneumonia usually presented as respiratory problems in infected cattle. On average the disease killed approximately half of the cattle in a newly infected herd and a quarter of the surviving cattle became carriers of the disease. Carriers were difficult to diagnosis so many stayed in herds infecting unexposed animals through coughing. This may be why the initial attempt to control the disease through quarantine and inspection failed and why the process of culling any infected or exposed cattle successfully eradicated the disease.
John Campbell and Jeanne Lofstedt, "Contagious Bovine Pleuropneumonia," Merck Veterinary Manual, http://www.merckmanuals.com/vet/respiratory_system/respiratory_diseases_of_cattle/contagious_bovine_pleuropneumonia.html (accessed May 04, 2013).

method of animal disease control, destruction of diseased cattle. In May 1887, Congress authorized the Department of Agriculture to purchase cattle with or exposed to pleuropneumonia. Bureau agents swiftly began destroying cattle to prevent the disease from spreading further west. This policy slowed the rate of infection leading to the eradication of the disease in 1892.[93] The quick halt to the disease created a precedent for culling as an effective method to eradicate the outbreak of an infectious animal disease.

Another communicable cattle disease that the BAI hoped to eliminate was Texas fever. While the Treasury department commission on the disease identified it as an enzootic condition in southern states where fever exposed cattle tended to grow slower and smaller but few died and as epizootic disease in Plains states like Kansas where high percentages of cattle who contracted the disease died, the study never identified the cause of the disease or how it spread through cattle drives.[94] In order to stop the spread of Texas fever, Kansas had banned all cattle from Southern states in 1885 and other Western and Plains states followed by the end of the year, creating a national patchwork of quarantines.[95] The negative economic impact of these quarantines, the increased economic reliance on the cattle industry in Southern states, the desire to import northern breeds to the Southern states, and the growing research demonstrating that cattle free of Texas fever grew larger and had higher quality meat that consumers demanded led to interest in eliminating the disease at the Bureau of Animal Industry.[96] The dual nature of the disease as enzootic and epizootic made the prospect of culling

[93]Export bans on American meat such as beef and pork remained in place until the creation of the Meat Inspection Act in 1890 and a supplemental act the next year. These two acts mandated the inspection of cattle about to be being sold for exports, cattle about to be slaughtered for export, and pork and salted bacon for export. The acts also authorized the inspection of all cattle, swine, and sheep sold interstate for slaughter with further their inspection of their products allowed and required the quarantine of all imported animals in an attempt to prevent the introduction or spread of diseases to different parts of the United States.
Baker, 23, 33.
Hoy and Nugent.
[94]Strom, 55.
[95]Strom, 53.
[96]Haygood, 560.

difficult, and cattle owners and researchers hoped that discovering the source of the disease would lead to a method of treatment or prevention than slaughtering exposed cattle. The bureau investigation of Texas fever began in 1888 and concluded by 1893 that the source of the infection was the cattle tick.[97] Armed with knowledge about the source of the disease, researchers at land-grant colleges, experiment stations, and the BAI and cattle owners focused on ways to eliminate the cattle tick or control exposure to it in order to control the disease. Despite knowing the source of the disease, a cure for Texas fever, renamed tick fever by researchers in an effort to educate cattle owners about the source of the disease, eluded researchers in the 1890s and early 1900s. Experiment stations and cattle owners tried many different chemotherapies, range management techniques, and cures but most either did not work or required large amounts of time, money, and effort that most cattle owners could not afford.[98] With no effective treatment or prevention program in place, varying rules and regulations relating to state quarantines, and increasing concern by the USDA about the economic loss caused by tick fever infection, the federal government authorized a national tick eradication program in 1906.[99] This program required the BAI to work in concert with state and local officials to develop statewide prevention schemes and quarantine systems. The state-federal tick eradication cooperative quickly ran into problems as about half of the eligible states optioned to keep working on a method of tick eradication independent of the federal government and cattle owners rejected the intrusion of the federal government into their local cattle operations. Only once a relatively cheap and easy method of

[97]The success of the investigation helped solidify the authority of science in animal disease control, the right of the government to intervene in animal health issues, and the role of the USDA as a hub of scientific agricultural research. The BAI investigation used the principles of germ theory and Koch's postulate for the framework of the study. Researchers isolated a parasitic protozoan that lived in cattle ticks and was transferred to cattle when the tick fed on an animal. This study became the model for the study of other diseases spread by vectors such as yellow fever and malaria. Not all veterinarians agreed with the study's conclusions including those who believed in germ theory. Some thought another agent may cause the disease and some thought that previous theories about fungi causing the illness may be correct.
Strom, 56.
Baker, 32.
Susan D. Jones, 31.
[98]Strom, 64.
[99]Haygood, 560-561.
Strom, 60.

control, arsenic dips, emerged as the standard for tick eradication in the early 1910s and the federal government committed to coordinating and financially supporting local dipping vats and quarantines did many Southern states and large herd owners approve of the eradication program.[100] Even with wider support and aggressive educational campaigns, the mandatory tick dips angered many yeoman Southern cattle owners who saw no economic advantage to preventing tick fever and resisted participation in the program.[101] Unlike contagious bovine pleuropneumonia that had quickly been eradicated from the American cattle population, tick fever persisted in parts of Texas and Florida until 1943.[102]

The state-federal tick eradication program exposed the possible problems related to eradicating an animal disease nationally. The lack of an effective method of control, the lack of participation by state and local governments, the lack of impact due to quarantine, and the lack of participation by individual cattle owners all hampered the effort to eradicate tick fever. The attempt to control the disease illustrated how regional differences and differences in cattle raising and production practices affected interest and participation in the eradication effort by researchers, veterinary health officials, and cattle owners. Each group had its own rationales and reasons for desiring or rejecting the initial attempts to end Texas fever and the required mandatory dipping program and quarantines. The state-federal tick eradication program served as an example of the necessity of cooperation between not only different levels of government, but also the cattle industry and cattle owners in order to operate an

[100]Schlebecker, *Cattle Raising*, 48.

[101]Most of the dissenting cattle owners did not transport cattle across the quarantine lines nor did they care or believe that the disease impacted the size of their cattle, so no economic incentive for eradication existed. Not only did some cattle owners see no economic advantage eradicating tick fever, some found dipping cattle to be economically disadvantageous even if the government paid for the vat and dip. Some ranchers reported cattle drowning or being damaged by the dipping process. In a number of Texas counties, gangs of cattle owners blew up dipping vats or knocked them down to prevent mandatory dipping of cattle.
Strom, 62-64.
Black, 30.

[102]"Conquering Cattle Tick Fever," ARS Research Timeline, https://www.ars.usda.gov/IS/timeline/tick.htm (accessed March 15, 2013).

effective disease eradication program.

One of the organizations for cooperation that developed during the tick eradication effort, the United States Livestock Sanitary Association (USLSA) grew into a vital organization for future disease eradication cooperatives. The group first met in 1897 and started as a forum for experiment station researchers, state sanitary commission officials, USDA researchers, and cattle owners, predominately Texans with large ranches or cattle drives, to discuss possible ways to prevent or cure tick fever so that northern markets remained open to Texas cattle.[103] Within 15 years, the organization had expanded with representatives from all 48 states and actively lobbied the BAI on a number of animal disease control topics.[104] The USLSA developed as a response to the economic problem of tick eradication quarantines and became an association that not only facilitated the interaction of health professionals and cattle owners, but also lobbied the Department of Agriculture to enact animal disease control measures supported by its members in both the public and private livestock disease control professions. The state-federal tick eradication program became a cautionary legacy about how to eradicate a disease and what happened when a significant number of constituencies involved in the process rejected the animal disease control effort. This resulted in an emphasis on cooperation in future disease eradication programs and the reluctance to develop federal eradication programs until a consensus on eradication had been reached by cattle owners, states, and veterinarians.

The BAI put the principle of waiting for consensus to the test with the bovine tuberculosis eradication effort. The program to eradicate bovine tuberculosis began as a state plan in 1896, but

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[103]Black, 1-2.

[104]Cattle owners who participated in USLSA meeting tended to be big producers who transported cattle or cattle products interstate and believed in the principles of scientific agriculture. The large livestock agricultural organizations and publications like the Texas and Southwestern Cattle Raiser's Association and *Hoard's Dairymen* often had representatives on USLSA committees and at the annual meetings. While small farmers participated in those groups, they were often dominated by the interest of cattle owners with deep pockets and large amounts of cattle. Many yeoman cattle owners and those who rejected the USDA's vision of agricultural practices relied on local government and action to voice their discontent for the eradication program and skepticism about the need for tick fever eradication.
Strom, 50-51.
Black, 4-5.

Congress did not authorize a federal eradication program until 1917 even though public health researchers connected bovine TB with human TB through milk in the first decade of the twentieth century.[105] Unlike earlier animal disease control program, the bovine tuberculosis eradication effort grew out of a desire to protect public health rather than the profits of cattle owners.[106] Based on the success of the federal eradication programs for pleuropneumonia and glanders, the Pennsylvania state veterinarian who developed the first state bovine tuberculosis program believed that the most successful eradication programs required support from participating cattle owners. When the state's eradication plan began, Pennsylvania animal health officials made participation voluntary and provided indemnity for destroyed cattle to avoid angering cattle owners and encourage participation.[107] The debate around the control of tuberculosis in cattle and its relationship with human tuberculosis became a major topic of discussion in the agricultural community at the start of the twentieth century often pitting the concerns and demands of cattle owners against those of health officials and consumers. Most cattle owners argued that little evidence existed demonstrating that exposure to bovine TB caused human cases of tuberculosis, that no effective method of controlling or eradicating the disease in cattle existed, and that efforts to cull or test for bovine tuberculosis just harmed their bottom line.[108] Arguments over the need for cattle TB control, the best method of testing, the best eradication program, and how to cover the cost of the program occurred at the local, state, and national levels through the agricultural media and professional agriculture and veterinary medicine organization like the United States Livestock Sanitary Association.[109] Cattle owners who rejected eradication efforts argued it harmed the cattle industry and its economics while veterinary and public health professionals who

[105]Black, 34.
Schlebecker, 89.
Susan D. Jones, 68.
[106]Olmstead and Rhode, 356.
[107]Susan D. Jones, 79-81.
[108]"It's Science Run Mad!" *Hoard's Dairyman* 30, no. 23 (1899): 450.
[109]Black, 32-34.

supported it cited controlling the disease in humans and public health as reasons to control the disease in cattle.

While many cattle owners opposed testing for TB at the start of the century, support for bovine tuberculosis eradication grew during the next two decades. Not only did economic concerns such as consumer pressure, quarantines, dairy sanitation requirements, and meat inspections encourage participation in state eradication program, but so did education about the relationship of animal and human tuberculosis, increasing industry pressure, and growing scientific evidence supporting the effectiveness and benefits of eradication.[110] By time the BAI began its state-federal bovine tuberculosis eradication program in 1917, the plan already had broad, though not universal, industry support and all but two states already recognized the once controversial tuberculin test.[111] Instead of having to fight for states, veterinarians, and cattle owners to accept the federal program, the Bureau of Animal Industry instead built on the existing state programs and wide ranging support for tuberculosis eradication.

While the federal program for bovine TB eradication did not formally start until 1917, the BAI was involved in the development of local and state programs and the debate over the relationship of animal and human health. The researchers at the federal bureau along with researchers at experiment stations and land-grant universities conducted experimental studies on tuberculosis and the tuberculin test and worked with states to improve testing procedures.[112] The Department of Agriculture and the extension services also produced educational material for cattle owners and veterinarians about bovine

[110]Susan D. Jones, 65-66.
Black, 32-34.

[111]While support of the TB eradication program had grown among cattle owners and in many states, some still resisted the program. During the Great Depression, the financial hardship of losing cattle to TB testing and the concerns over the effectiveness of testing led to physical conflict between farmers, law enforcement, and state veterinarians trying to test cattle in one Iowa county. Due to the threat of violence the governor declared martial law in the county and called in the National Guard to ensure that laboratory technicians finished testing samples. Farmers also relied on legal means to try and end the eradication program, but the Iowa Supreme Court ruled that the TB eradication program was a constitutional public health measure.
Black, 34-35.
Susan D. Jones 72.

[112]Baker, 50.
Susan D. Jones, 79.

tuberculosis and the advantages of eradication, and officials from the bureau attended USLSA and other organizational meetings to discuss TB control.[113] In addition, the bureau ran the federal meat inspection programs established in the 1890s that included inspection for tuberculosis.[114] The creation of a state-federal eradication program provided funding and allowed the BAI to implement a national system of culling and quarantine, but the previous absence of a program did not prevent the bureau from being involved in the debate over bovine tuberculosis and state eradication efforts. The development of the TB eradication program demonstrated how a disease eradication plan could form and how the Bureau of Animal Industry could be involved in the process even without a formal state-federal eradication program.

The battle over the implementation and acceptance of a bovine tuberculosis eradication program also illustrated the tension between economics and public health in the rational and rhetoric of animal disease control. This tension existed since the establishment of the BAI though bureau staff placed an emphasis on the economic value of creating a healthy livestock population and focused on selling disease eradication to politicians and livestock owners through claims of economic benefit.[115] Federal veterinarians and researchers claimed a role in human public health by preventing zoonoses, but this reason for animal disease control often played a small role in justification for an animal disease control program compared to economic rationales as in the case of glanders.[116] The decision to eradicate tuberculosis from the cattle population originated in the desire of a Pennsylvania state veterinarian to

[113]Black, 32-34.
[114]Susan D. Jones, 82.
[115]Ibid., 16, 30.
Olmstead and Rhode, 358.
[116]Primarily a disease of horses, mules, and donkeys caused by the bacteria *Burkholderia mallei,* glanders can spread to humans though that rarely occurs. Epizootics of glanders in animals saw no corresponding epidemics of glanders in people so public health was not usually used as a justification for glanders eradication. Horse owners and animal health professionals focused on the economics of horses and their usefulness when calling for glanders eradication. During the mid and late nineteenth century horse owners worried about glanders because it quickly spread through stables and frequently led to the death of a horse. At the time people relied on horses for transportation and work animals and the loss of a horse or multiple horses placed an economic and labor burden on owners.
Clay McShane, "Gelded Age Boston," *The New England Quarterly* 74, no. 2 (2001): 287 – 289.

control the incidence of tuberculosis in people rather than to protect the profit of cattle owners and many cattle owners, veterinarians, and health officials worried that the eradication process would negatively impact the cattle industry due to the cost of testing and the loss of livestock and products.[117] Some health officials aimed to merge the public health and economic reasons for eradication by arguing that consumer demands for disease-free products made tuberculosis-free cattle more valuable and that eradication made it easier to transport cattle interstate and abroad.[118] These claims faced skepticism from the cattle industry since owners, in particular those with dairy cattle, often did not receive enough compensation for a destroyed animal to cover the cost of a new animal and producers struggled to maintain profit margins as they tried to comply with new laws requiring TB-free milk and dairy products.[119]

The Bureau of Animal Industry also faced a contradiction in its mission during the tuberculosis eradication campaign. The BAI upheld itself as an institution that benefited the livestock economy, but with tuberculosis and other diseases checked for during meat inspection, it prioritized public health over the cattle economy.[120] Stuck between its two regulatory functions, meat inspection and improving the agricultural economy, the bureau placed human public health above profit for cattle owners.[121] The bovine TB eradication program represented the contradiction inherent in the control of zoonotic diseases; was the goal of the program to protect human health or the economic health of the agricultural industry? The rhetoric of protecting public health alone did not drive many cattle owners to join the tuberculosis eradication program, but by creating economic incentives through indemnity, quarantines, and food quality laws local, state, and federal governments tried to encourage the participation of cattle owners in the cooperative program.

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[117]Susan D. Jones, 79-82.
[118]Ibid., 69-71, 80.
[119]Ibid., 69.
[120]Ibid., 82.
[121]Ibid., 32.

By the 1920s, the Bureau of Animal Industry had established itself as the scientific authority on animal diseases and most cattle owners accepted its role in regulating animals to improve the health of livestock even though not all of the bureau's programs and research resulted in successful or beneficial outcomes.[122] Even though many cattle owners acknowledged the BAI and its work, they still fought against programs that they thought hurt their bottom line while campaigning for the bureau, experiment stations, and land-grant universities to research and control diseases they thought harmed their animals.[123] This tension between demanding government assistance and fighting against it at the same time was part of the larger relationship between farmers and government in the early twentieth century. Producers often claimed they abhorred bureaucracy and the intrusion of government regulation into farm life while at the same time accepting it and asking for it when it benefited them and their finances.[124] Like other types of farmers, cattle owners both resisted and participated in policy and politics that impacted themselves.[125] Cattle owners concerned about disease control programs expressed themselves not only as individuals through all levels of government but also used agricultural groups like the Texas and Southwestern Cattle Raisers Association and livestock sanitation organizations like the United States Livestock Sanitary Association to lobby for their viewpoint on cattle disease control. By the first World War, the relationship between the Bureau of Animal Industry, researchers, government health officials, veterinarians, and cattle owners had developed into a complex cooperative that required flexibility and input from all constituencies to operate a successful cattle disease eradication program.

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[122]Susan D. Jones, 32.
Schlebecker, *Cattle Raising*, 239-240.
"Live Stock Health," *Hoard's Dairyman* 62, no. 21 (1921): 619.
J. Evetts Haley, "The SMS Ranch Papers: Testimony and Articles by Frank S. Hastings March 24, 1920 – May 16, 1922," (Stamford, TX: The Swensons Land and Cattle Company, 1932), 2G466, Swensons Land and Cattle Company Papers, University of Texas Archive.
[123]Schlebecker, *Cattle Raising*, 239-240.
[124]Sanders, 407.
[125]Stock and Johnston, 6.
Schlebecker, *Cattle Raising*, 239-240.

Conclusion

In the United States, agricultural producers have been a part of the political, cultural, and economic fabric of country since the colonial era. Many American politicians in the late eighteenth and nineteenth centuries extolled the virtues of small, independent farmers and their role in the development and expansion of the United States, creating a cultural atmosphere that allowed farmers to claim that they were representatives of the American ideal of a self-sufficient producer. While much of the population viewed the yeoman farmer as independent and self-reliant, many producers wanted the federal government's intervention to solve land disputes, set grazing rights prices, establish water usage rules and establish policy that they viewed as favorable. During the nineteenth century, as the country expanded and industrialized, the federal government created laws and regulation aimed at addressing the needs of many farmers and those who relied on their products including acts that converted public land to private farm land and improved the methods of getting goods to urban markets. As a result, producers in rural areas often interacted with government agents and directly dealt with the effect of laws and regulations on their livelihoods. Since cultivators and livestock owners were impacted by the state and its policy, they created organizations that advocated for agricultural producers and encouraged farmers to engage in the political progress in order to shape policies and laws that affected their lives and businesses. As a result, farmers gained agency in the political system more than ever before leading to the creation of more farm laws and agrarian concerns being integrated into major parties' platforms during the latter part of the century. The United States government developed numerous policies and laws to address the growing demands and needs of the agricultural sector as producers leveraged their cultural and economic power into political power in order to dictate the development of government agricultural laws and regulations.

The expansion of the federal government in the agricultural sector included the development of

the United States Department of Agriculture in 1862. Building on the work of the patent office and the growing scientific agriculture movement, the USDA was founded on the principles of scientific experimentation and testing. Researchers and administrators at the department relied on science and technology to solve the problems of the American farmer and make American agriculture more productive with less work. In addition to conducting research on farming techniques, soil, and equipment, the department also acted as a repository for agricultural information and educated farmers about what department researchers and administrators believed to be the best practices for cultivating crops and livestock. Along with the USDA, the federal government and states established land-grant universities, experiment stations, state agriculture departments, and extension services that focused on agricultural research and distributing information to producers. These agencies constituted a scientific agricultural network that connected agriculture research efforts across the country. While some farmers adopted practices advocated by the Department of Agriculture, universities, and extension services, some preferred knowledge derived from field experience rather than the laboratory or test fields. Many producers incorporated both into their farm and ranch practices, and many farmers had common industry practices tested by land-grant universities, extension services, or on their own to show through science that these methods were beneficial agricultural techniques. By the 1920s, most American producers accepted the concept of scientific agriculture. They relied on science and technology to increase production, make land more arable, improve crop and livestock breeds, and ensure the health of agricultural products.

One of the major sectors of the American agricultural industry in the nineteenth century was cattle. Cattle quickly became the dominated livestock in the Americas after being introduced by both the Spanish and the British. The animals and their byproducts became a cornerstone of the colonial livestock market in the seventeenth and eighteenth century. In the United States during the nineteenth century, the number of cattle and their economic value increased as domestic demands for better meat

and dairy products rose and improved trans-Atlantic transportation allowed for increased international sales of American cattle. During the late 1870s and 1880s, an epizootic of contagious bovine pleuropneumonia led to a ban on American cattle in Britain and threatened domestic production of profitable cattle-based products due to loss of animals. In response to this blow to the agricultural economic and other threats of disease in livestock, the Department of Agricultural developed the Bureau of Animal Industry in 1884. The establishment of the BAI was in keeping with the USDA's scientific focus and goal of increasing agricultural profitability. The bureau employed laboratory science, epidemiology, and veterinary medicine to control animal diseases in order to improve the health and value of American livestock. Many of the veterinarians and researchers at the bureau accepted germ theory and utilized its principles to determine the cause of animal diseases and try to develop methods of preventing the diseases from spreading. The threat of animal diseases also led Congress to grant the Department of Agriculture regulatory authority to inspect agricultural products and the right to eliminate a declared epizootic disease. This included the power to purchase diseased animals and kill them along with the power to quarantine herds and prevent the transportation of potentially diseased livestock.

The Bureau of Animal Industry's eradication campaign for three cattle diseases in the late nineteenth and early twentieth centuries highlighted the successes and difficulties of ending cattle epizootics. Most cattle owners, state and federal animal health officials, and veterinarians were driven by economic concerns when deciding how to proceed with the eradication of a particular cattle disease. In the case of a contagious disease like bovine pleuropneumonia that killed cattle and created a barrier to international trade, most cattle owners participated in the federal eradication program because of the clear economic value of eliminating the disease. Participation in the tick fever eradication program and bovine tuberculosis eradication effort faced more difficulty since many cattle owners and some animal disease control officials and veterinarians determined that control of the diseases was not economically

beneficial. The demands of many Northern and Western cattle owners drove the demand for a tick fever eradication program to prevent the death of their cattle, but many yeoman Southern cattle owners rejected the program due to the potential harms of dipping and the threat of government interference in their business. For those cattle owners who resisted the tick eradication program, the enzootic infection of tick fever presented less economic risk than the arsenic dip utilized to kill the ticks. The debate over how to control tick fever in the 1890s led to the establishment of the United States Livestock Sanitary Association, an organization composed of state and federal animal health officials along with veterinarians and cattle owners. This organization allowed many different stakeholders to negotiate their differences over the bureau's tick program and by the early twentieth century, it became the primary group establishing priorities for the BAI and recommending how to proceed with eradication programs for other animal diseases.

In the case of bovine tuberculosis, the demand to end the disease in the late nineteenth and early twentieth centuries arose from public health officials and consumers who were concerned about the spread of tuberculosis between cattle and people instead of from cattle owners who feared the monetary depreciation of diseased cattle or the death of their animals. Many cattle owners thought the science connecting the two diseases was tenuous and that controlling for TB would prove too costly for industry. The economics of tuberculosis and its eradication led most cattle owners to initially reject state attempts to control the disease. While the disease harmed cattle by causing weight loss or other damages that devalued their worth, the loss of value caused by culling represented a larger potential loss to revenue for cattle owners. City, state, and the federal government bans on meat and dairy products from cattle with TB shifted the economic balance for cattle owners, making eradication cheaper than owning a potentially worthless animal. Support for state tuberculosis eradication program grew in the early twentieth century due in part to the changing economics of owning tuberculosis-free cattle. When the USDA bovine TB eradication program was implemented in 1917, the plan to eradicate

the disease had broad support from the livestock industry.

The development of the state-federal bovine tuberculosis eradication program demonstrated not only the need for industry cooperation and the importance of economics in the debate over animal disease control, but also how public health and concerns about the health of human populations affected animal health policy. The debate over bovine tuberculosis revealed an existing rift between the roles of the Bureau of Animal Industry. The bureau created disease eradication policy to protect the agricultural interest of producers and also regulated and inspected agricultural products to prevent zoonotic diseases from spreading to humans. While the BAI developed with a focus on the economics of healthy livestock, some veterinarians and researchers argued that the agency should have a more public health focus and aim to improve the health of both livestock and people. The debate over eradication of zoonotic diseases such as tuberculosis forced state animal disease control agencies, the Bureau of Animal Industry, cattle owners, and veterinarians to discuss the underlying principles of animal disease control and if public health or agricultural economics dictated the rationale for eliminating an animal disease.

The BAI eradication programs for bovine pleuropneumonia, tick fever, and bovine tuberculosis in the late nineteenth and early twentieth century demonstrated the value of economics in the development of animal disease eradication programs and the need for industry cooperation in order to make an eradication program successful. Cattle owners, veterinarians, and animal health officials tried to work together through organizations like the United States Livestock Sanitary Association to develop eradication programs with wide support from the cattle industry and those interested in animal health. These early cattle disease programs highlighted how eradication program developed for diseases based on the perceived risk of the disease to an animal's value and how cattle owners and state animal health agencies rejected federal programs when they determined that the cost of the program outweighed the cost associated with the disease. In the case of bovine tuberculosis, a zoonosis, public

health became a factor in the development of an eradication program along with the economics of the disease and public health officials and consumers became part of the discourse on bovine TB eradication. The experience of developing these three federal cattle disease eradication programs in the late nineteenth and early twentieth century impacted how the Bureau of Animal Industry, state animal health officials, cattle owners, and veterinarians approached animal disease control in the twentieth century as other cattle diseases, both epizootic and enzootic, became targets for state-federal eradication programs.

Chapter 2: Abortion Storms and Bacteria – The Conceptualization of Contagious Abortion and Its Relationship with Human Disease, 1850 – 1929

In a 1912 speech presented to the Eastern Guernsey Breeders' Association, researcher Karl F. Meyer warned Pennsylvania breeders that their state was "soaked with contagious abortion" and that "we have to be extremely careful and try our best to eradicate this disease, not only from a national economic point of view but also from a purely sanitary and hygienic point of view."[1] This call for action represented a growing demand by veterinary medicine researchers and some cattle owners to end the problem of contagious abortion or Bang's disease through sanitation, vaccination, or chemical methods. They saw the disease as an epidemic that must be stamped out of the United States cattle population. The understanding of contagious abortion as an epidemic disease that veterinary medicine and cattle owners could end developed in the mid-nineteenth century with the first American investigations of the disease. The discovery of the causal agent in the 1890s gave veterinary medicinal scientists and cattle owners a target for eradication and increased research into possible cures and prevention methods for the disease.

In the early twentieth century, many cattle owners, particularly dairy owners who faced the greatest economic risk from Bang's outbreaks, wanted eradication for economic reasons and called upon the federal research network to determine the cause of the disease and create a way to eradicate it. At the same time, some medical researchers worried about the impact of Bang's bacillus on humans since infected cows eliminated the bacteria in their milk. In 1918, a Department of Agriculture researcher, Alice Evans, published the results of a study concluding that *Bact. abortus*, the causal agent for contagious abortion, and *Bact. melitensis*, the causal agent for Malta fever, were closely related. This discovery changed the understanding of both diseases and the two bacteria in the medical community in the 1920s as mounting evidence suggested that Malta fever occurred in the United States

[1]Karl F. Meyer, "Infectious Abortion," *Practical Dairyman: A Practical Weekly*, December 15, 1912, 904.

due to raw milk from cows infected with Bang's though the rate of infection seemed relatively small compared to the rate of raw dairy consumption. By the late 1920s, some cattle owners and health professionals wanted to eradicate Bang's for different reasons but the majority of those concerned about the cattle disease did not want a mandatory eradication program for Bang's due to the lack of knowledge about the pathologies of the diseases caused by *Brucella abortus*.

Cows and Abortion Storms in the Nineteenth Century

Abortions had always been a part of life for cattle owners with cows and a potentially economically devastating event for breeders and dairy farmers.[2] In the mid-nineteenth century, veterinary medicine books for farmers listed many possible causes for abortions ranging from dirty water and stalls, bad feed including grain contaminated by ergot, wheat or corn smut, and other vegetable parasites, diseases of the digestive system and kidneys, exposure to decaying animal matter including carcasses and the abortion discharge of other cows, falls, slips, pressure to the abdomen, overheating, overmilking, breeding the animal too young, and feeding cows too much or too little.[3] Most in veterinary medicine focused on the miasmas caused by decaying animal matter along with water and food quality as the cause of abortions. They thought that the reproductive system of the cow related to its digestive system based on the idea that pregnancy usually caused nausea and weird eating

[2]In cattle, the term abortion was used to describe the process of a cow birthing its fetus before it could survive and sometime it was also used when calves were born early, often sickly but surviving though that was an incorrect usage of the word. The process was commonly known in the American agricultural community as slinking a calf in the nineteenth and early twentieth century.
James Law, *The Farmer's Veterinary Adviser: A Guide to the Prevention and Treatment of Disease in Domestic Animals* (Ithaca: James Law, 1887), 315.
George H. Dadd, *The American Cattle Doctor: Containing the Necessary Information for Preserving the Health and Curing the Diseases of Oxen, Cows, Sheep, and Swine, with a Great Variety of Original Recipes, and Valuable Information in Reference to Farm and Dairy Management* (New York: Orange Judd, 1851), 191-192.

[3]Francis Clater, William Youatt, and John Stuart Skinner, *Every Man His Own Cattle Doctor Containing the Causes, Symptoms, and Treatment of all the Diseases Incident to Oxen, Sheep, and Swine; and a Sketch of the Anatomy and Physiology of Neat Cattle* (Philadelphia: Lea and Blanchard, 1848), 72.
Law, 315-316.
Dadd, 191.

patterns in pregnant animals. In this sympathetic situation, upsetting the digestive system of a cow through bad odors, water, or food unbalanced the animal's nervous system that then disturbed the womb causing the cow to slink its calf.[4] The recommended prevention and treatment for abortion involved a nutritious diet, clean water, and sanitary living conditions along with avoiding leaping, falls, or any physical activities that impacted the abdominal region.[5] Veterinary medical professionals of the mid-nineteenth century thought that cattle, like humans, benefited from sanitation improvements and that access to food and water free of disease causing molds, parasites, and fungi reduced the rate of abortion.

Many of these mid-century animal care books also noted the potential for abortions to occur in all or many of the pregnant cows on one farm at the same time or for cows to slink calves multiple times over a course of years. These events, often called abortions storms, caused economic problems for cattle owners since they depleted calf stock and cows who aborted produced less milk. Some in the veterinary medical field speculated that one cow aborting may cause other cows to do the same in a sympathetic response, and if a cow repeatedly aborted or a herd of them repeatedly aborted even after a farmer improved sanitary conditions, then the best course of action was to sell them for slaughter since "such influence is as fatal as the direst contagion."[6] The incidence of abortion storms seemed different from isolated incidences of abortion in a herd or abortions that stopped after improving sanitary conditions. Veterinary medicine practitioners and cattle owners worried about the potentially contagious nature of these incidences as an epidemic of abortions spread through the Northeast.[7] In New York, the first reports of abortion storms came in 1852 and by the early 1860s, there seemed to be a marked increase in the number of cows slinking their calves with an estimated 5% of all pregnancies

[4]Dadd, 193.
Law, 316.
[5]Dadd, 193-194.
Law, 316-317.
[6]Clater, Youatt, and Skinner, 72.
Dadd 191 – 192.
[7]New York (State) and J. C. Dalton, *Report of J.C. Dalton, M.D., Commissioner of the New York State Agricultural Society, for the Investigation of Abortion in Cows* (Albany: C. Van Benthuysen & Sons, 1868), 5.

in cows ending in abortion.[8] Unable to replace aging cattle with their own calves and with less product to sell, cattle owners in the New York State Agricultural Society requested the organization conduct a study to determine what caused abortion storms and how to stop them. The study investigated all of the suspected causes of abortion including geographical differences, sanitary conditions, the age of breeding, and the amount of milking by surveying and inspecting over 1,000 farms in the state.[9] The initial results presented in 1868 found no evidence that wind, soil, bad feed or water, poor sanitation, heat or cold, milk production practices, age of the cow, or defect of the fetus or uterus caused abortion storms. The abortions usually remained confined to one farm, rather than distributed across all the farms in one area as would be expected if local conditions caused abortions.[10] Sometimes investigators traced the incidents to outside factors like a new cow being brought in, but other times the abortions just appeared in the herds that had no new cattle or sources of food and water.[11] The study found no evidence of ergot or other harmful feed or grazing plants that may cause abortions.[12] The results of a followup investigation of cows from affected farms published the next year determined that no spores or microscopic vegetation caused the abortions and that autopsies of aborting cows and their fetuses indicated no active disease or infection.[13] The researchers also noted that most farmers did not separate aborting cows from the herd since they had no way to determine which cows would abort and that they often did not remove the resulting fetal product. Since so few farmers separated aborting cows or

[8]Ibid., 9-13.
[9]Ibid., 3-8.
[10]Ibid., 31-40.
[11]Ibid., 41.
[12]Ibid., 50.
[13]The 1869 report emphasized the importance of having properly trained and qualified staff to investigate and report on contagious abortion. The New York Agricultural Society invested in and relied on science and those in the medical field to solve the problem of abortion storms. The studies involved farmers responding to surveys about the conditions at their farms, but then gave medical professionals the authority to investigate farms and draw conclusions to find the cause and the solution to contagious abortions. This study represented part of a larger movement in animal and human health to utilize science to determine the source of a medical problem and treat it that had started in the mid-nineteenth century and grew through the rest of the century.
William H. Carmalt, *Report for the Investigation of Abortion in Cows* (Albany: Van Benthuysen, 1869), 10.
John Harley Warner, *The Therapeutic Perspective: Medical Practice, Knowledge, and Identity in America, 1820-1885* (Cambridge, Mass: Harvard University Press, 1986).

disposed of fetal material, researchers remained unable to determine if the smell or sight of either of these things caused other cows to abort in sympathetic response.[14] With no known cause, no effective treatment for abortion storms arose from the study, and the problem of contagious abortion persisted into the late nineteenth century as the condition spread into the Midwest.

The concern over abortions, the cause, and how to prevent them from happening continued among cattle owners, veterinarians, and researchers in the late nineteenth century.[15] The disease seemed to impact dairy cattle owners the most since the "great shrinkage in yield of milk, after abortion, makes a financial loss that every farmer can appreciate."[16] These cattle owners along with researchers and veterinary medicine professionals wanted a way to prevent abortions from occurring and tried to determine the cause of slinking in order to prevent the financial loss associated with it. Many accepted the theory that an abortion could be caused by one of any number of problems including mistreatment, a nervous imbalance, mineral deficiencies, bad feed or water, unnatural farm conditions, or poor sanitary conditions.[17] How one abortion turned into an abortion storm still perplexed those trying to limit the incidence of slinking a calf. The debate over the contagious nature of abortions continued as some believed that abortion storms resulted from a sympathetic response to one cow having an abortion while others believed it must be caused by some contagion since all or most of the cows aborted and the incidence of abortions seemed to mysteriously appear and disappear with no possible explanation of what caused the first cow to abort.[18] Scientific studies conducted by experiment stations and individual

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[14]Carmalt, 31.

[15]William Horne, "Veterinary," *Hoard's Dairyman* 24, no. 47 (1894): 762.

[16]W.W. Cooke, "Effect of Abortion on Quality and Quantity of Milk," *Hoard's Dairyman* 24, no. 17 (1893): 275.

[17]Horne, 24, no. 47, 762.
"Injuries as Related to Abortion," *Hoard's Dairyman* 24, no. 44 (1893): 840.
"Notes, Inquires, and Answers," *Hoard's Dairyman* 24, no. 3 (1893): 39.
"Notes, Inquires, and Answers," *Hoard's Dairyman* 24, no. 8 (1893): 123-124.
"To Prevent the Spread of Abortion," *Hoard's Dairyman* 24, no. 3 (1894): 41.
M. Schembri, "Where Is the Cause of Abortion?," *Hoard's Dairyman* 27, no. 6 (1896): 103.

[18]The debate over the contagious nature of abortions was not unique to the United States. In the early nineteenth century, most French cattle owners believed abortions to be contagious while most French veterinarians rejected the idea. Only in the 1870s and 1880s and after numerous scientific experiments did the majority of French veterinarians accept the idea of

farmers aimed at finding the cause shed no light on the subject of causation.[19] The cause of abortions and abortion storms remained undetermined complicating the ability of cattle owners and veterinarians to deal with the disease and minimize economic loss due to it.

With no consensus on the cause of the abortions or the relationship of abortion storms to individual cases of abortion, recommendations for prevention and treatment of abortions varied greatly. Each cattle owner and veterinarian seemed to have a different recommendation based on the number of abortions that occurred and if he or she believed in contagious abortion. The prescription of gentle treatment and sanitary conditions prevented abortions according to those who suspected most cases arose from mistreatment or poor living conditions.[20] Those who thought their cows aborted due to phosphate deficiencies often thought phosphate of lime helped restore health.[21] For those hoping to prevent abortions that seemed to come and go with no cause, personal experience often determined how they dealt with the disease. Some cattle owners thought that running cattle with pigs or goats reduced the likelihood for abortion based on personal experience.[22] Others still relied on improving sanitary conditions to calm cattle since they saw the abortions as a nervous condition.[23] Many cattle owners believed in natural and chemical compounds that prevented or treated abortions due to their personal experience. By adding these items to feed, water, or applying them to the cows, cattle owners

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contagious abortion.
"Infectious Abortion," AR 59-1, Carton 4, Folder 23, University of California San Francisco Archives.
"A Sure Way to Lose Calves," *Hoard's Dairyman* 24, no. 7 (1893): 115.
"Notes, Inquires, and Answers," *Hoard's Dairyman* 24, no. 41 (1893): 655.
T.L. Haecker, "Abortion," *Hoard's Dairyman* 24, no. 45 (1893): 727.
Geo. C. Slayton, "A Vermont Inquiry," *Hoard's Dairyman* 27, no. 52 (1897): 1034.
[19]"Notes, Inquires, and Answers," 24, no. 8: 123.
William Horne, "Veterinary," *Hoard's Dairyman* 24, no. 50 (1894): 807.
"Oil Meal and Abortion," *Hoard's Dairyman* 25, no. 46 (1895): 742.
[20]Horne, 24, no. 47, 762.
"A Sure Way to Lose Calves," 115.
"Injuries as Related to Abortion," 840.
"Notes, Inquires, and Answers," *Hoard's Dairyman* 25, no. 8 (1894): 119.
[21]"Bone Meal for Abortion," *Hoard's Dairyman* 25, no. 3 (1894): 41.
[22]"Abortion in Cows: Pig as Prevention," *Hoard's Dairyman* 24, no. 36 (1893).
[23]"Notes, Inquires, and Answers," 25, no. 8, 119.

swore by their chosen preventative or cure and shared this information with fellow cattle owners, veterinarians, and researchers through word-of-mouth and trade publications. Asafoetida, black willow, wood ash, bichloride of mercury, poke-root, hemp seeds, and carbolic acid prevented or treated contagious and sympathetic abortions according to different cattle owners.[24] Most cattle owners recognized that since multiple causes of abortion existed, multiple treatments and preventative measures existed as well so there was no guarantee that any one solution worked.[25] However, many tried something in an attempt to prevent abortions or end the epidemic cycle early in an attempt to limit economic losses due to abortion. Some cattle owners and veterinarians recommended saving money by doing nothing at all since an abortion storm usually ended in about a year or two.[26] They thought that most people just kept trying cures until they found one that seemed to work, but in reality that treatment coincided with the natural end of the abortion epidemic.[27] For these individuals the cause of the disease remained mysterious, but the typical course of epidemic abortion resulted in the end of the abortion storm without needing to take any action and spending extra money on sanitation measures, natural compounds, or chemicals.

No matter what the course of action, cattle owners only wanted to keep cows that recovered and returned to normal milk production and breeding. Many cattle owners, including both those who treated for abortion and those who did not, advocated fattening and selling any cows with little value as

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[24]"Notes, Inquires, and Answers," 24, no. 3, 39.
"To Prevent the Spread of Abortion," *Hoard's Dairyman* 24, no. 4 (1893): 67.
"Abortion,"*Hoard's Dairyman* 24, no. 12 (1893): 190.
T.L. Haecker, "Abortion and Failure to Breed," *Hoard's Dairyman* 24, no. 50 (1894): 807.
"Notes, Inquires, and Answers," *Hoard's Dairyman* 24, no. 51 (1894): 815.
"Black Willow for Abortion," *Hoard's Dairyman* 24, no. 52 (1894): 840.
"Notes, Inquires, and Answers," *Hoard's Dairyman* 25, no. 28 (1894): 454.
"A Remedy for Abortion," *Hoard's Dairyman* 26, no. 34 (1895): 669.
"Hemp Seeds for Abortion," *Hoard's Dairyman* 26, no. 39 (1895): 774.
[25]"Inquires and Answers," *Hoard's Dairyman* 26, no. 50 (1896): 981.
Charles L. Hill, "Mr. Hill's Experience and Views on Abortion," *Hoard's Dairyman* 27, no. 4 (1896): 74.
[26]"Inquires and Answers," 26, no. 50, 981.
[27]W.A. Henry, "Epidemic Abortion," *Hoard's Dairyman* 24, no. 27 (1893): 434.

milkers or as dams.[28] These cows were not worth the cost of treatment and prevention and had the same value as an aged cow past her prime. Ultimately, decisions to use preventatives, cures, sanitary measures, or do nothing at all came down to what the cattle owners thought saved them the most money and improved the economics of their herd. With no known cause and no universal remedy, every cattle owner and veterinarian seemed to have their own course of action based on his or her own experience with abortion storms and the financial cost and benefit of treating cattle.

In addition to feed additives, solutions, and tonics that farmers made on their own or created using available products, proprietary medicines developed by veterinarians and cattle owners existed to prevent or cure abortions. Often lumped together as a prevention or cure for other reproductive conditions including failure to breed, retention of the placenta, and nymphomania these patent medicines promised to restore the reproductive health of cows. Farmers employed these treatments, which were advertised in trade journals, to prevent abortions or end epidemic abortion from spreading in a herd. The advertisements themselves often appeared near veterinary columns in order to catch the eye of consumers already interested in learning about medical treatment of cattle. Most of the producers of these patent medicines claimed extensive testing proved the success of their serums, tonics, and powders. They also provided testimonials of satisfied customers in the advertisements or in free pamphlets available to cattle owners through the mail.[29] These proprietary medicines seemed to have the desired mix of scientific and practical proof. By claiming the medicines to be formulated by those with veterinary sciences experience and tested by actual farmers, these advertisements aimed to capture the attention of cattle owners who embraced scientific veterinary solutions and also those who valued the opinion of farmers with years of field experience above all else. Many cattle owners tried these products believing that trusted veterinarians, who often also wrote for trade journals, and the

[28]"Notes, Inquires, and Answers," 24, no. 8, 123-124.
[29]See Images 2.1 to 2.9 for a collection of advertisements for abortions preventatives and cures from *Hoard's Dairyman* in the 1890s. Similar ads ran in other dairy cattle focused publications like *The Practical Dairyman*.

journals themselves would not promote ineffective cures or treatments.[30] Cattle owners mostly reported success with these products and experiment stations that tested them often found no conclusive evidence that the medicines reduced the rate of abortion, but also determined they cause no harm.[31] Just as with other non-proprietary treatments some cattle owners and veterinarians saw these medicines as a waste of money and recommended just waiting for the abortion storm to run its course.[32] During the 1890s, proprietary medications ended up with the same assessment as non-proprietary treatments. Many of them seemed to work for cattle owners and each cattle owner who used them picked their preferred patent medicine based on cost benefit and their experience with its success.

[30]"Abortion," 190.
"Notes, Inquires, and Answers," 25, no. 8, 119.
[31]Haecker, "Abortion," 727.
W.R. Thomas, "Experience with Abortion," *Hoard's Dairyman* 25, no. 12 (1984): 191.
[32]"Inquires and Answers," 26, no. 50, 981.

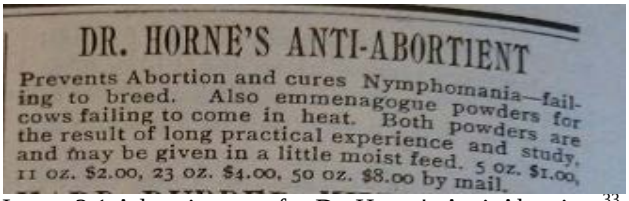

Image 2.1 Advertisement for Dr. Horne's Anti-Abortient[33]

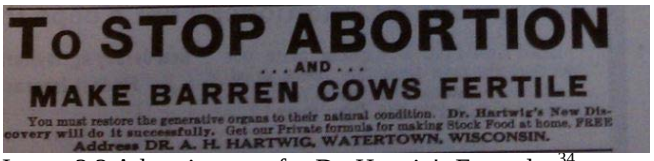

Image 2.2 Advertisement for Dr. Hatwig's Formulas[34]

Image 2.3 Advertisement for Hood Farm Abortion Cure[35]

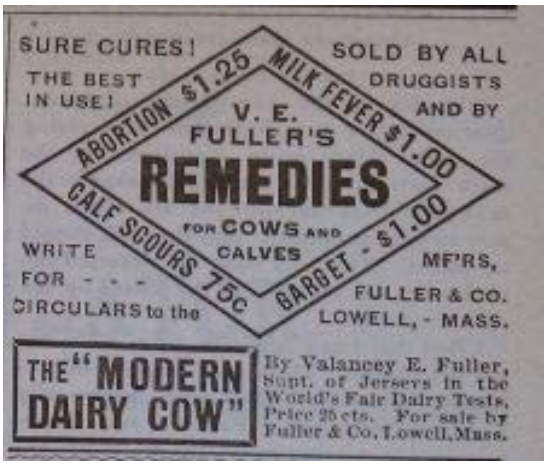

Image 2.4 Advertisement for V.E. Fullers' Abortion Cure[36]

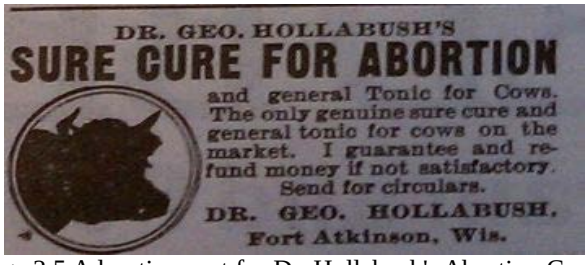

Image 2.5 Advertisement for Dr. Hollabush's Abortion Cure Tonic[37]

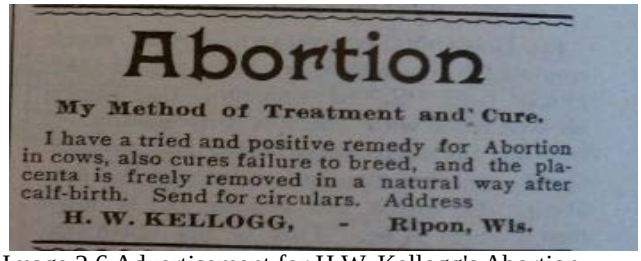

Image 2.6 Advertisement for H.W. Kellogg's Abortion Remedy[38]

[33]"Dr. Horne's Anti-Abortient Advertisement," *Hoard's Dairyman* 24, no. 47 (1894): 762.
[34]"Dr. Hatwig's Formulas Advertisement," *Hoard's Dairyman* 40, no. 40 (1909): 1191.
[35]"Hood Farm Abortion Cure Advertisement," *Hoard's Dairyman* 33, no 21 (1902): 457.
[36]"V.E. Fullers' Abortion Cure Advertisement," *Hoard's Dairyman* 26, no. 16 (1895): 313.
[37]"Dr. Hollabush's Abortion Cure Tonic Advertisement," *Hoard's Dairyman* 40, no. 40 (1909): 1191.
[38]"H.W. Kellogg Abortion Remedy Advertisement," *Hoard's Dairyman* 24, no. 47 (1894): 762.

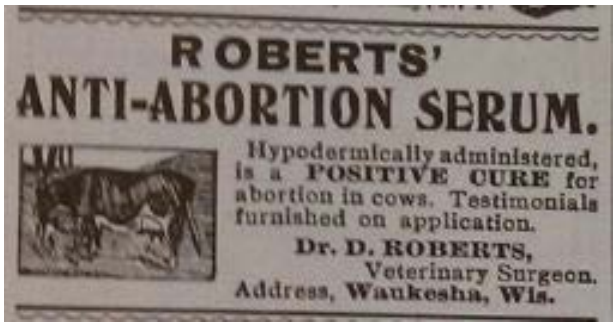

Image 2.7 Advertisement for Dr. Roberts' Anti-Abortion Serum[39]

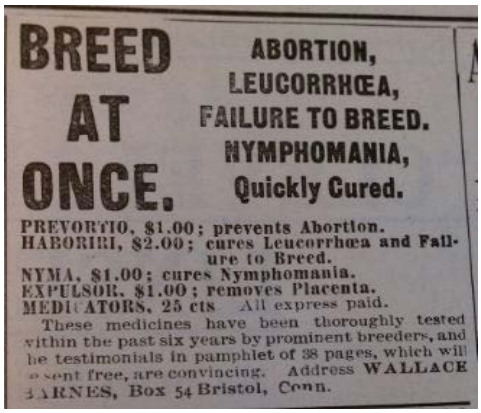

Image 2.8 Advertisement for W. Barnes' Abortion Preventative[40]

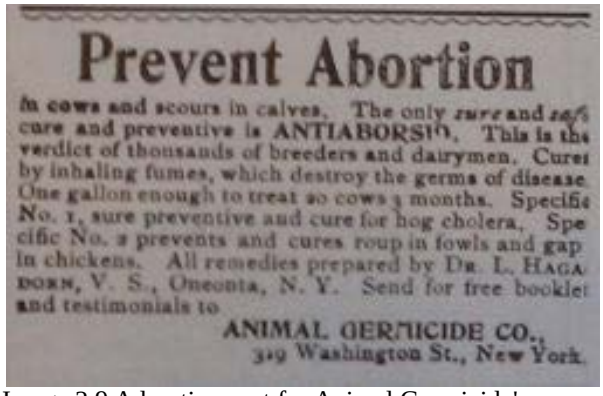

Image 2.9 Advertisement for Animal Germicide's Antiaborsio[41]

[39]"Dr. Roberts' Anti-Abortion Serum Advertisement," *Hoard's Dairyman* 29, no. 35 (1898): 721.
[40]"W. Barnes' Abortion Preventative Advertisement," *Hoard's Dairyman* 24, no. 49 (1894): 795.
[41]"Animal Germicide's Antiaborsio Advertisement," *Hoard's Dairyman* 29, no. 35 (1898): 721.

Germ Theory and Contagious Abortion

The discussion of the contagious nature of abortion and possible treatments and cures changed in 1897 when a Danish veterinarian Bernhard Lauritz Frederik Bang and his student Stribolt reported isolating a rod-shaped organism from the uteri of cows that had aborted and used it to induce abortion in other cows.[42] Other researchers including Edmond Nocard in France proved abortions to be contagious by using aborted material to induce abortion in cows, but this marked the first time someone isolated a bacterium found in the womb of aborting cows and met the criteria established in Koch's postulate.[43] Researchers and cattle owners around the world began speculating if the bacillus found by Bang also caused contagious abortions in their own countries or if some other cause still remained the source of epidemic abortions.[44] In the United States, the research network of the Department of Agriculture, land-grant universities, and experiment stations conducted experiments aimed at confirming that Bang's bacillus caused abortion storms among American cattle and determining how the disease spread through a herd. These studies quickly drew sharper lines separating different occurrences of abortion and firmly dividing contagious abortion and noncontagious abortion.[45] Rather than define abortions as one medical condition with many different causes, the isolation of the abortion bacillus allowed veterinary medical scientists to define the type of abortion based on cause. They recognized that other factors such as feed contaminated with ergot and smut, falls, putrid water, nervous conditions, and inflammation or defect as a result of other diseases caused abortion, but differentiated those types of abortions from epidemic abortion caused by a contagion that transferred

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[42]M. Monir Madkour, *Madkour's Brucellosis* (Berlin: Springer, 2000), 18-19.

[43]"Bernhard Bang, (1848-1932) Veterinary Physician," *The Journal of the American Medical Association* 208, no. 4 (1969): 687.

[44]"Stray Thoughts and Jottings," *Hoard's Dairyman* 27, no 25 (1896): 490.
W. Robertson, *Abortion in Cattle* (Cape Town: Townshed, Taylor, and Snashall Publishing, 1905), 5, AR 59-1, Carton 10, Folder 77, University of California San Francisco Archives.
F. Torrance, *Report of the Veterinary Director General (F. Torrance, B.A., D.V.S.) For the Year Ending March 31, 1913* (Ottawa: C.H. Parmelee, 1913), 89, AR 59-1, Carton 12, Folder 92, no. 1, University of California San Francisco Archives.

[45]James Law, *Abortion, or Slinking the Calf* (Washington, D.C.: Government Printing Office, 1905), 1.

from animal to animal and from herd to herd.[46] Researchers did not abandon previous concepts of what caused abortion, they just fully separated them from contagious abortion. The idea that epidemic abortion started with a noncontagious abortion and spread through sympathetic response had been effectively eliminated in the American veterinary medicinal research community during the first decade of the 1900s due to the results of their research. However, while researchers had accepted that epidemic abortions arose from a contagion, no consensus had been reached on the causal germ. Many different germs seemed to cause abortion in United States, not just Bang's bacillus. These different bacteria caused abortion at different stages of pregnancy, but all seemed to primarily affect cows by causing abortions.[47] While researchers separated noncontagious and contagious abortion, they had not differentiated between abortions caused by different types of contagions.

In addition to working on confirming the contagious nature of epidemic abortion, veterinary medical scientists began to determine how the disease spread and possible ways to prevent the bacteria from passing from cow to cow. Experiments during the late 1890s and early 1900s indicated that cows did not contract the disease by being in the proximity of an aborting cow. Instead it required direct contact with the genitals of an infected animal or the aborted material. Cows acquired abortion causing bacteria by licking anything touched by the infected cow's genitals or the aborted fetus. Along with cows, pregnant goats, sows, ewes, and rabbits had abortions after exposure to the same germ that caused abortions in cattle. In addition to cows, researchers targeted bulls as the likely source of infection and the mode for spreading the bacteria from herd to herd. A bull would service a cow who had aborted, acquire the bacteria, and then pass it to the next cow he serviced either in the same herd or

[46]Ibid., 2-5.
[47]Ibid., 6-7.
W.L. Williams, *The Granular Venereal Disease and Abortion in Cattle* (Washington, D.C.: United States Department of Agriculture, 1914), 16.

in another one.[48] This changed the target of prevention and treatment. Since the incidence of abortion had been framed by the act of having an abortion, cows had been the only animals thought to be impacted by the disease. Either through sympathetic or infectious means, the cow had been thought of as the source of abortion storms. The acceptance of contagious abortion and the research into the spread of the disease widened the pool of susceptible animals to include bulls. Though they seemed to suffer no negative health consequences from infection, the disease still had to be controlled among them in order to control it in cows.

News about Bang's discovery quickly spread through the veterinary and cattle owning communities through bulletins released by the USDA and experiment stations and trade publications. Some veterinarians and cattle owners adopted the belief that germs caused contagious abortion while others still favored other causes, but many cattle owners and veterinarians expressed confusion on the issue.[49] In response to a letter from a Vermont farmer inquiring why the journal published so much different advice and information about abortion, the editors of *Hoard's Dairyman* responded that "the difficulty in writing about it [abortion] is that so far, there is too little real scientific knowledge and data to draw upon. Men can theorize and guess this and that, but such talk only adds to the confusion of the inquirer's mind."[50] In 1897, confusion over the cause and treatment of abortion and the best method to prevent it in the dairy community and the lack of scientific evidence behind any of the current theories of causation and effectiveness of preventatives and cures caused many cattle owners to call for greater scientific research into abortion and continued education for cattle owners when new information became available. Abortions still represented a great source of lost income in the dairy community and

[48]Law, 6.
[49]William Horne, "Veterinary," *Hoard's Dairyman* 28, no. 14 (1897): 277.
"Abortion in Milk Cows," *Hoard's Dairyman* 28, no. 40 (1897): 794).
[50]Slayton, 1034.

many cattle owners focused on finding a cause in order to develop a cure.[51] They endorsed the work of researchers at experiment stations, universities, and the Department of Agriculture in hopes that it would lead to the ability to control abortion in their cattle.

As the body of research supporting the conclusion that contagious abortion caused abortion storms grew in the years after Bang's discovery, veterinarians and cattle owners began to adopt disinfectants and other sanitary precautions to try and prevent the spread of the causal bacteria. Some had already begun douching cows who aborted and disinfecting pregnancy stalls in the early 1890s due to the results of Nocard's experiments with transmitting the disease via aborted material and the recommendation by a group of Danish veterinarians who believed abortions to be contagious through the cow's genitals, but the general acceptance of contagious abortion increased the interest in prevention and treatment through disinfection.[52] By the mid-1900s, the Bureau of Animal Industry, experiment stations, most veterinarians, and most cattle owners sharing advice with their colleagues recommended separating aborting cows from any places or structures other cows or breeding animals went, repeatedly disinfecting any stalls the aborting cow had been in or near, fully removing any parts of the placenta not expelled by the cow, burning or deeply burying all afterbirth and the fetus, douching the cow after abortion for a period of time, and disinfecting any clothing worn or item used when dealing with the aborting cow. They also suggested using a different bull to service cows after they aborted and disinfecting the bull's sheath and underbelly after breeding.[53] These sanitation protocols aimed at preventing the spread of the causal bacteria, though with no possible way to test for abortion causing bacteria and no other clinical manifestations but the abortion itself, cows that experienced abortions potentially exposed the herd to the germ long before being identified. In addition,

[51]"Inquires and Answers," *Hoard's Dairyman* 28, no. 32 (1897): 625.
[52]"Inquires and Answers," *Hoard's Dairyman* 27, no. 40 (1896): 789.
"Contagious Abortion," *Hoard's Dairyman* 37, no. 34 (1906): 880.
[53]Law, 9-11.
William Horne, "Veterinary," *Hoard's Dairyman* 29, no. 38 (1898): 761.
A. Sufferer, "Abortion – An Epidemic," *Hoard's Dairyman* 30, no. 6 (1899): 117.

no clear evidence existed that cows gained immunity from having an abortion and the potential existed for cows to still be a carrier after an abortion.[54]

Another problem with sanitation regimens was that they cost significant time and money. Some cattle owners saw this investment of capital as worth the expense since it lessened the economic impact of contagious abortion, though not all cattle owners agreed.[55] Many dairy cattle owners remained optimistic that science could provide a solution to the economic problems of contagious abortion, as it recently had for milk fever, blackleg, and hog cholera, and actively lobbied Congress for more funding for contagious abortion research.[56] Many in the cattle owning community hoped researchers would develop a method of testing that allowed cattle owners to determine which cows had contagious abortion germs and better methods of prevention and treatment that reduced the risk of exposure and effectively cured infected cattle.

As research began to shape a clearer definition of contagious abortion and new sanitary based methods of prevention and control developed, cattle raisers became more concerned with the economic impact of contagious abortion. Awareness of the disease along with decreasing rates in other infections like tick fever, tuberculosis, and milk fever in the late 1900s and early 1910s made contagious abortion a more significant problem in cattle. Many cattle owners, especially dairy farmers who suffered due to the loss of milk, perceived contagious abortion to be one of the most significant diseases facing the cattle industry and so did an increasing number of veterinarians, animal health officials, and researchers.[57] Many of those working in animal disease control thought it to be one of the biggest problems in cattle along with TB since it caused not only a loss of a calf but also a decrease in milk

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[54]Law, 10.
"Contagious Abortion," *Hoard's Dairyman* 30, no. 14 (1899): 281.
[55]A.H. Hartwig, "Veterinary," *Hoard's Dairyman* 35, no. 32 (1904): 799.
F.W. Wilson, "Contagious Abortion in Cattle," *Hoard's Dairyman* 38, no. 22 (1907): 600.
[56]"Treatment for Infectious Abortion," *Hoard's Dairyman* 40, no. 18 (1909): 575.
"Editorial Comment – Appropriation for Contagious Abortion," *Hoard's Dairyman* 51, no. 20 (1916): 812.
[57]"Contagious Abortion," *Hoard's Dairyman* 47, no. 9 (1914): 334.

production.[58] Even though contagious abortion did not seem as prevalent as other diseases in cattle, its effects had a devastating impact on the monetary value of a herd.[59] One animal health official estimated that the country lost fifty million dollars annually to the disease and in a speech at the annual meeting of the Cattle Raisers Association of Texas in 1913, the chief of the Bureau of Animal Investigation stated that contagious abortions ranked with tick fever, scabies, blackleg, and tuberculosis as one of the worst animal diseases and for breeders the disease accounted for the second greatest amount of loss after TB.[60] The concern over the economics of contagious abortion spurred further research into the cause of contagious abortion and methods of control.

Bang's Bacillus in the United States during the 1910s and 1920s

Veterinary medical researchers continued to investigate contagious abortion and by the mid-1910s had greatly increased knowledge about the etiology of the disease. In 1912, a publication on experiments conducted at the Kentucky Agricultural Experiment Station conclusively linked Bang's bacillus to contagious abortion in the United States.[61] Difficult to culture, it had taken many attempts to find the proper method of isolating and culturing the bacteria in order to utilize it in experiments. At the Kentucky station, researchers had been able to isolate Bang's in three herds, successfully culture it,

[58]E.S. Goed "Infectious Abortion," in *Fifteenth Annual Meeting of the United States Live Stock Sanitation Association, Chicago, IL, December 5 & 6, 1911*, 114 (Chicago: Live Stock World, 1912), AR 59-1, Carton 12, Folder 92, no. 1, University of California San Francisco Archives.

[59]Charles Beardshaw, "Contagious Abortion," *Hoard's Dairyman* 42, no. 28 (1911): 866.

[60]W.L. Williams "Contagious Abortion," in *Sixteenth Annual Meeting of the United States Live Stock Sanitation Association, Chicago, IL, December 3, 4, & 5, 1912*, 111 (Chicago: Live Stock World, 1913), AR 59-1, Carton 12, Folder 92, no. 2, University of California San Francisco Archives.

Cattle Raisers Association of Texas, *Proceedings of the Thirty-Seventh Annual Meeting of the Cattle Raisers Association of Texas, El Paso, TX, March 18-19-20, 1913* (Fort Worth, TX: Texas Printing Co., 1913), 66-67, 2P134, Texas and Southwestern Cattle Raisers Association Records, University of Texas Archives.

[61]Other organisms isolated by earlier researchers could cause abortion, but the most common and widespread causal bacterium was Bang's bacillus.

Goed, 118-119.

Edwin S. Good, *Investigations of the Etiology of Infectious Abortion of Cows and Mares* (Lexington, KY: Kentucky Agricultural Experiment Station of the State University, 1912), 272-278.

F.A. Rich, *Concerning Infectious Abortion* (Burlington, VT: Vermont Agricultural Experiment Station, 1923), 18.

infect guinea pigs and cause abortions in them.[62] With a working method of culturing determined, scientists in American agricultural disease research settings began to explore the relationship of contagious abortion to the bacillus and possible methods of testing and treatment. Agglutination testing and complement fixation testing developed as a method to determine the presence of Bang's providing a method of determining if an animal had been exposed to contagious abortion outside of the act of abortion.[63] For the first time bulls, calves, and other mammals could be tested for the disease improving research into how the bacteria spread and the susceptibility of animals. In addition, cattle owners could now test cattle to determine if they had contagious abortion making it possible for owners to develop disease-free herds.

As research into Bang's bacillus continued into the late 1910s and 1920s, a defined picture of contagious abortion developed. Studies by the BAI, experiment stations, and land-grant universities clarified the etiology and epidemiology of the disease. Testing for exposure to the bacteria and experimentation in state owned herds demonstrated that bulls did not act as a carrier for the disease or pass it from cow to cow, but instead, an infected cow introduced into the herd as a replacement usually spread the disease.[64] Observations of aborting cattle indicated that few symptoms (the udder and the external genitals occasionally swelled just before abortion) outside of abortion existed to indicate if an animal had been infected with the bacillus and the rate of abortion in a herd had no bearing on the actual rate of infection since not all of the pregnant cows aborted. The only way to determine which animals in a herd had the disease was by testing. Both compliment fixation and agglutination testing

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[62]Good, 278.

[63]Three ways of testing for Bang's bacillus existed. One was to isolate the bacteria, culture it in a guinea pig, and see if it aborted. This method was the only positive way to confirm active infection but was time consuming and expensive. Agglutination testing and compliment fixation testing determined if Bang's bacillus antibodies were present in an animal's blood rather than the actual bacteria. By testing for antibodies rather than the bacteria, these test only determined exposure to Bang's and not active infection.
Good, 314.

[64]Rich, 12.
"The Bull and Contagious Abortion," *Hoard's Dairyman* 53, no. 5 (1917): 217.
C.D. McGilvray, *Infectious Abortion of Cattle* (Toronto: Ontario Department of Agriculture, 1924), 4.

required blood samples, specialized laboratory workers, and neither test indicated active infection.[65] While experimentation on contagious abortion had increased in the twenty-five years after Bang made his initial discovery and yielded more information on the bacillus and the resulting disease, contagious abortion still confused and perplexed researchers.[66] One researcher at the Vermont Agricultural Experiment Station wrote that the contagious abortion existed as

> a freaky disease. It may savage a herd,
> disappear slowly or perhaps suddenly,
> lie dormant for years and then break forth
> again with almost startling suddenness.
> The infection may be mild or virulent. A
> cow or two may abort or it may sweep
> through the herd.[67]

The lack of consistency in the type of infection frustrated those trying to explore the epidemiology of the disease.

Veterinarians and cattle owners along with researchers had been perplexed by the course of contagious abortion and the difficulty in diagnosis and controlling the disease during the 1910s and 1920s. In the mid-1910s as the BAI researched the best method of control, the bureau used the rhetoric of epidemic disease control to move cattle owners to action. Despite classifying contagious abortion as a cattle disease with a significant economic threat, the bureau, states, and local governments refused to establish an eradication program due to the fact that the bacillus was widespread, difficult to diagnosis, and no consensus on the best method of eradication existed among veterinarians and animal health officials.[68] Instead, in pamphlets, farmers' bulletins, speeches, and articles in trade journals the bureau encouraged cattle owners to control contagious abortion in their herd through isolation and sanitation.[69]

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[65]Rich, 24.
[66]J.F. DeVine, "Abortion Disease and Its Control: Extracts of Address by J.F. DeVine before the United States Live Stock Sanitary Association," *Hoard's Dairyman* 59, no. 1 (1920): 7.
[67]Rich, 17.
[68]W.L. Williams, *The Granular Venereal Disease and Abortion in Cattle*, 16.
[69]"A Campaign Against Abortion Has Already Begun," *Hoard's Dairyman* 57, no. 14 (1919): 706 – 708. United States Department of Agriculture, *Fight Contagious Abortion in Cattle; on Your Farm, in Your District* (Washington, D.C.: United States Department of Agriculture, 1916), 2.

These calls for control often emphasized the danger of abortion, calling it a thief in the night that stole offspring and milk productivity therefore threatening the American supply of beef and milk. Only by individual owners independently working to control contagious abortion could the country avoid a declining cattle population.[70] The way the USDA communicated with cattle owners about contagious abortion during the mid-1910s appeared similar to the language used to encourage participation in eradication program such as emphasizing the economic peril of the disease and the responsibility of each cattle owner to eliminate the disease in his or her own herd though no eradication program existed.

Many dairy cattle owners and breeders who had contagious abortion in their herds or hoped to prevent the spread of the disease began following the sanitation guidelines established by the Department of Agriculture. In addition to these sanitation measures, many cattle owners also utilized oral antiseptics like carbolic acid, methylene blue, and cresol in order to destroy the germ if it entered a cow's body.[71] The suggestion to use these chemicals and the method of use often came from farmers themselves and spread by word of mouth or trade journals. Some cattle owners kept using patent medicines advertised in agricultural publications to treat or prevent abortions from occurring.[72] Once the Bang's bacillus had been positively identified as the cause of contagious abortion in 1912, another avenue of control developed, vaccines. Made by commercial laboratories these vaccines consisted of either a live or dead strain of Bang's. Just like proprietary medicine sellers, vaccine manufactures advertised in trade journals and used the appeal of science and practical experience to entice cattle

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[70]Ibid., 2.
Cattle Raisers Association of Texas, 67 – 70.

[71]George Rice, "Abortion – Carbolic Acid Treatment," *Hoard's Dairyman* 32, no. 1 (1901): 2.
"Inquiries and Answers," *Hoard's Dairyman* 32, no 3 (1901): 56.
"Veterinary," *Hoard's Dairyman* 34, no. 3 (1903): 67.
"Recommendations of the Bureau of Animal Industry on the Problems of the Live Stock Industry," *The Cattleman* 22, no. 8 (1925): 22.

[72]Unlike the patent drug industry for humans that started to decline after the passage of the Food and Drug Act in 1907, animal medicine remained unregulated until the passage of the 1938 Federal Food, Drug, and Cosmetic Act.
United States Food and Drug Administration, Chronological History of the Center for Veterinary Medicine, United States Food and Drug Administration
http://www.fda.gov/AboutFDA/WhatWeDo/History/FOrgsHistory/CVM/ucm142587.htm (accessed March 10, 2013).

owners into using their products.[73] Many cattle owners hoping to prevent contagious abortion or treat animals who aborted tried these additives, medicines, and vaccines. In the early twentieth century, cattle owners used their own herds to experiment with additives, medicines, and vaccines and their reports of practical experiences with these treatments and cures impacted the practice of other herd owners.[74] The use of these methods on the farm also influenced the research conducted by state agricultural experiment stations. Many of the stations conducted experiments with their herds to determine if the chemicals and vaccines used by cattle owners prevented or treated contagious abortion.[75] The herds of individual cow owners and also of experiment stations became testing grounds for contagious abortion preventatives and cures.

By the mid-1920s, many cattle owners had growing doubts about controlling contagious abortion.[76] Some still wanted to eradicate the disease in their herds because of the economic toll it wrought, but no preventative measure or treatment seemed to effectively eliminate the Bang's bacillus. The sanitary method seemed to work to some degree, but the process required constant vigilance, time, and money.[77] For some this effort cost more than allowing contagious abortion to work its way through the herd. Many of the cattle owners who had utilized cures, preventatives, and vaccines had also experienced disappointment. Studies conducted by experiment stations and extended practical

[73]"Purity Serum Co. of Texas Advertisement," *The Cattleman* 6, no. 11 (1920): 31.
[74]Thomas, 191.
"Anti-Aborsio," *Hoard's Dairyman* 30, no. 28 (1899): 551.
"Inquires and Answers," *Hoard's Dairyman* 30, no. 34 (1899): 669.
"Inquires and Answers," Hoard's Dairyman 32, no. 3 (1901): 56.
"Inquires and Answers," *Hoard's Dairyman* 33, no. 42 (1902): 865.
G.C. Kenyon, "Carbolic acid for Abortion in Cows," *Hoard's Dairyman* 35, no. 4 (1904): 74.
H. B. Gurler, "Mr. Gurler's Experience in Abortion," *Hoard's Dairyman* 39, no. 51 (1909): 1413.
W.A. Merigold Jr., "Contagious Abortion Discussion," *Hoard's Dairyman* 54, no. 5 (1917): 138.
T.O. Booth, "Control of Infectious Abortion: Ranchmen Can Not Safely Temporize with an Infectious Disease," *The Cattleman* 15, no. 3 (1928): 23.
[75]"Contagious Abortion," *Hoard's Dairyman* 37, no. 34 (1906).
George. M. Potter, "Contagious Abortion of Cattle," *Hoard's Dairyman* 56, no. 25 (1919): 854.
Rich, 31.
[76]"Editorial Comment – Dilly-dallying with Contagious Abortion," *Hoard's Dairyman* 67, no. 20 (1924): 734.
[77]Rich, 28

experience by cattle owners found that oral chemical additives and patent medicines had no effect on Bang's infection.[78] The natural cyclical pattern of contagious abortion disappearing accounted for the results farmers saw and often the disease reappeared a few years later. By the mid-1920s, most cattle owners and veterinary medical professionals saw proprietary medicines and oral antiseptics as a waste of money.[79] Many also thought vaccines held little value in controlling the disease. Bacterins, made from attenuated Bang's bacillus, conferred no or limited immunity while vaccines made with live strains caused the disease in uninfected animals. The only situations where veterinarians and researchers suggested using the live vaccine was in highly infected herds not used for breeding.[80] With no cures, treatments, or widely usable vaccine available, contagious abortion continued to plague cattle owners in the 1920s.

Research on contagious abortion continued in the 1920s with the Bureau of Animal Industry spending between forty and fifty thousand dollars on the topic each year.[81] While researchers continued to refine their understanding of the disease, no progress had been made in discovering a cost effective treatment or cure.[82] However, scientists at the Bureau of Animal Industry and experiment stations continued to modify their suggestions for herd management and offered new advice to cattle owners based on their most current research and shared it in farmers' bulletins, trade journals, and speeches.[83]

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[78]"Editorial Comment – Abortion Cures," *Hoard's Dairyman* 69, no. 1 (1925): 9.
"Veterinary," *Hoard's Dairyman* 69, no. 1 (1925): 27.

[79]In October 1923 *Hoard's Dairyman* stopped accepting advertisements for abortion cures due to overwhelming consensus that they did not work. They still allowed advertisements for antiseptics, disinfectants, and medicines claiming to prevent contagious abortion, just nothing that claimed it cured the disease.
"Editorial Comment – Abortion Cures," 9.
"Editorial Comment – Contagious Abortion Disease," *Hoard's Dairyman* 66, no. 12 (1923): 320.

[80]George H. Hart, "Controlling Contagious Abortion," *Hoard's Dairyman* 71, no. 9 (1926): 336.

[81]"Editorial Comment – New Ideas on Abortion," *Hoard's Dairyman* 58, no. 21 (1919): 990.

[82]Bureau of Animal Industry, "A Campaign Against Abortion Has Already Begun," *Hoard's Dairyman* 57, no. 14 (1919): 706 – 708.

[83]In the early 1920s one of the proposals for clarifying information about the disease was changing the name since the disease was not actually contagious but rather infectious. In 1921, the United States Livestock Sanitary Association began taking suggestions for a new name and eventually changed it to infectious abortion in the late 1920s, but it was little used outside of the research community. The terms Bang's disease and brucellosis did not come into wider use until the following decade. Until the start of the state-federal brucellosis eradication program in the 1950s most veterinarians,

By the mid-1920s, researchers had determined that Bang's bacillus caused approximately 90% of all bovine abortions, that the infection usually spread orally through feed and water contaminated by vaginal discharge or aborted material, that healthy cows who carried the disease spread it when calving, and that infected cows only acted as a disease spreading agents when calving or aborting and up to ten days after the event.[84] Speculation about the ability of cows to carry the bacteria even when they calved normally existed before, but definitive evidence of this event shifted suggested control policies. Before, only aborting cows had been suspected of spreading Bang's bacillus. Now, all pregnant cows, even those who had not aborted, became suspect. Researchers and veterinarians recommended cattle owners move all pregnant cows to segregated maternity stables shortly before calving and leave them there for two weeks after calving or aborting to avoid the period where cows actively shed the bacillus.[85] By isolating pregnant cows and keeping separate facilities and supplies for them, animal health professionals and cattle owners hoped to limit the possibility of cows contaminating feed and water with infectious vaginal secretions. However, like previous isolation and sanitation measures, it required money and extra work along with extra land to house these new facilities.

Another development from experiment stations and land-grant universities impacted suggested control measures in the 1920s; testing. Complement fixation and agglutination testing shifted the recommended course of action for cattle owners whose herds suffered from contagious abortion in the mid and late 1920s and the idea of what constituted a Bang's bacillus infected animal. Researchers at

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animal health officials, and cattle owners used the two terms interchangeably. After the program began, medical professionals tended to use the term brucellosis to talk about the disease while many farmers still used the term Bang's and other terms derived from it like “banger” or “banged out”.
Rich, 16.
Committee on Infectious Abortion of the National Research Council, “Meeting Minutes: April 20, 1934,” (1934): 71, AR 59-1, Carton 23, Folder 173, no. 2, University of California San Francisco Archives.
Black, Neal F. 1996. Animal Health: a century of progress. Richmond, VA: United States Animal Health Association.
Neal F. Black, *Animal Health: A Century of Progress* (Richmond, VA: United States Animal Health Association, 1996), http://portals5.gomembers.com/Portals/6/AnimalHealth-ACenturyOfProgress.pdf (accessed February 17, 2013), 42.
Animal and Plant Health Inspection Service, *Don't Buy Brucellosis: One Test Is Not Enough!* (Washington, D.C.: United States Department of Agriculture, 1977).

[84]E.C. Schroeder, “Bovine Infectious Abortion – Control Measures,” *Hoard's Dairyman* 66, no. 12 (1923): 312.
[85]Ibid., 312.

the Bureau of Animal Industry and experimental stations relied on Bang's bacillus antibody testing to determine the contagious abortion status of animals in their experimental herds since it had been determined that even non-aborting cows may be infected. Testing meant that abortion was no longer the only indication of infection status. Reactors to the complement fixing or agglutination test transformed from “healthy” cattle into “diseased” cattle even if they never had an abortion. The act of aborting no longer defined Bang's bacillus infection but rather the test for exposure to the bacteria itself did. Though not completely accurate, it had a high enough accuracy to satisfy researchers of its effectiveness.[86] By testing all the cattle in a herd, researchers often found many of the cows in the herd, even those calving normally, tested as reactors, making contagious abortion endemic rather than epidemic as it had seemed when abortions swept through a herd.[87] Being able to determine the health status of any animal, not just those aborting revealed the widespread range of Bang's bacillus and decoupled the infection from the clinical manifestation of abortion.

With testing available, scientists at experiment stations developed contagious abortion-free herds by a combination of isolating calves, heifers, cows, and bulls, eliminating infected animals, and testing newly purchased animals to prevent the spread of disease. An increasing number of veterinarians and researchers from experiment stations, land-grant universities, and the USDA recommended that cattle owners test their herds to determine the level of contagious abortion infection and then, based on that level, implement a plan created to develop a clean herd. If no cases existed, then the farmers continued their current system and made sure they purchased disease-free cattle if they needed replacement animals. In cases with less than 10% of cattle reacting to blood tests, researchers encouraged herd owners to sell off infected cattle to create a disease-free herd. In herds that had more than 10% of cattle reacting, many animal health professionals recommended selling the entire herd and

[86]“New York Dairymen and Breeders Meet,” *Hoard's Dairyman* 48, no. 26 (1915): 969.
[87]B.T. Simms, “Controlling Abortion in Cattle,” *Hoard's Dairyman* 68, no. 7 (1924): 148.

starting from scratch or isolating calves and raising a contagious abortion-free replacement herd.[88] These eradication programs focused on the individual herds and encouraged owners to eradicate contagious abortion for their economic benefit.

Using testing some cattle owners determined the disease status of their herds and built herds free of Bang's bacillus, but testing never received broad support from cattle owners in the 1920s.[89] One of the reasons had to do with the inconvenience of herd testing. Complement fixation and agglutination testing required blood samples from each animal and then those samples had to be sent to a laboratory where a specialized, trained technician had to perform the procedure. All of this took time, money, and effort. In Vermont, state law allowed cattle owners and veterinarians to send blood samples to the State Laboratory of Hygiene for testing starting in the mid-1910s. However, few individuals sent in samples due to the cost and the amount of work required to get blood samples from a whole herd.[90] In addition, testing for contagious abortion cost more since it had to be sent away rather than conducted on the farm by cattle owners or their veterinarians. On top of the initial testing, cattle owners had to continue testing their cattle periodically to make sure Bang's bacillus had not been reintroduced so it became a repeating burden both in time and money. Another cost also existed for eliminating reactors. Selling any reacting cattle and purchasing disease-free replacement animals added another expense to the suggested contagious abortion eradication program. In many cases, cattle that produced normal amounts of milk or calved regularly tested as reactors, and herd owners faced the dilemma of selling productive cows or allowing Bang's exposed cattle in the herd.[91] Another reason why cattle owners may have been reluctant to embrace testing had to do with the accuracy of the process. After some cattle owners started testing for Bang's bacillus and eliminated all reactor cattle, they still ended up

[88]Hart, 336.
[89]"Editorial Comment – Contagious Abortion," *Hoard's Dairyman* 71, no. 3 (1926): 85.
"The Agglutination Test," *Hoard's Dairyman* 72, no. 21 (1927): 1077.
[90]Rich, 25
[91]Committee on Infectious Abortion of the National Research Council, "Report of Committee on Infectious Abortion, April 12 1924," (1924): 2, AR 59-1, Carton 23, Folder 174, no. 2, University of California San Francisco Archives.

with cows that aborted and then reacted to subsequent testing.[92] Researchers never claimed the tests to be entirely accurate, but the rate of false negatives gave some cattle owners pause about using testing to develop disease-free herds. In addition, cattle owners recently dealt with a similar circumstance for tuberculosis testing which also tested for the presence of antibodies rather than active infection. Many cattle owners thought TB testing killed too many healthy, productive animals just because they reacted.[93] Along with the fear of false negatives, the fear of false positives leading to an overdepleted herd loomed in the mind of herd owners. Testing for the abortion bacillus exposed how widespread contagious abortion was in herds across the United States, but it also created tension over the economics of eradicating the disease. For some just keeping their reactor cattle and allowing the disease to remain endemic in their herds seemed to make more sense since many seemed healthy and those who aborted often went on to calve and produce milk normally. Doing nothing and just allowing the disease to run its course made the most financial sense to these cattle owners.[94] For these individuals, the economics of testing for contagious abortion and developing disease-free herds did not compare favorably to the economics of doing nothing or just segregating pregnant cows as a precaution.

By the end of the 1920s, many researchers at the Bureau of Animal Industry, experiment stations, veterinarians, and some trade journals encouraged cattle owners to eliminate contagious abortion in their herds by testing for it and then consulting with a veterinarian to develop a proper herd management program that would lead to a disease-free herd and prevent reinfection.[95] When the federal eradication program for tuberculosis began in 1917, the two diseases caused about the same amount of loss to the agricultural sector. The state-federal TB eradication program lowered the rate of bovine tuberculosis infection therefore lowering the economic impact of the disease so that at the end of the

[92]"Editorial Comment – Congress and Abortion," *Hoard's Dairyman* 73, no. 3 (1928): 364.
[93]"It's Science Run Mad!," *Hoard's Dairyman* 30, no. 23 (1899): 450.
"Veterinary," *Hoard's Dairyman* 54, no. 13 (1917): 433.
[94]J.R. Dice, "Getting Rid of Abortion," *Hoard's Dairyman* 74, no. 1 (1929): 23.
[95]"Weeding Out Contagious Abortion," *Hoard's Dairyman* 73, no. 17 (1928): 797.

1920s, contagious abortion became the costliest cattle disease in the United States.[96] Those favoring Bang's bacillus control through testing and herd management cited the devastating economic impact of contagious abortion on all segments of the cattle industry due to the loss of calf and the loss of milk and claimed that creating a disease-free herd ultimately cost less than allowing Bang's bacillus to remain endemic.[97] Many in veterinary medicine recognized the difficulty and burden that sanitation measures, testing, and culling placed on cattle owners and that no ideal method of control existed that would justify the creation of a state-federal eradication program.[98] Instead, they encouraged herd owners to do as much as possible to curtail Bang's bacillus among their own cattle while addressing the financial concerns of their business.[99]

However, testing often led to more confusion and difficulty for farmers who had to choose between selling and replacing productive reactors or just allowing contagious abortion to run its course through the herd. Even if a cattle owner invested the money in ridding his or her cattle of contagious abortion, this method of developing a clean herd still left open the possibility of reinfection from a replacement animal or a false negative cow.[100] No cure or vaccine for Bang's bacillus existed though many cattle owners held out hope that a simpler, cheaper, more effective method of eradication developed.[101] The causal organism of contagious abortion had been found, the course of the disease had

[96]While contagious abortion ranked as the costliest cattle disease of the 1920s, other epidemic diseases drew the attention of the Bureau of Animal Industry and resulted in eradication programs or concerted research efforts. In the 1910s and 1920s several outbreaks of foot-and-mouth disease threatened cattle populations across the United States. Since animals infected with foot-and-mouth disease lost all value, cattle owners, states, and the federal government usually moved swiftly to end these outbreaks through quarantine and culling. Most states and the Bureau of Animal Industry approved eradication protocols ahead of time in case the disease ever reemerged
Norman Radder, "Minnesota Controls Contagious Abortion," *Hoard's Dairyman* 59, no. 20 (1920): 52.
Charles Wood, "Science and Politics in the War on Cattle Diseases: The Kansas Experience, 1900-1940," *Agricultural History* 54, no. 1 (1980): 88-89.
Donald Spear, "California Besieged: The Foot-and-Mouth Epidemic of 1924," *Agricultural History* 56, no. 3 (1982): 528-541.
[97]Simms, 148.
[98]Hart, 336.
[99]Dice, 22-23.
[100]"Abortion Control in Oregon," *Hoard's Dairyman* 73, no. 22 (1928): 1046.
[101]"Editorial Comment – Abortion Cures and Control," *Hoard's Dairyman* 72, no. 20 (1927): 995.

been observed, and a method of testing infected animals determined, but contagious abortion control still relied heavily on sanitation measures as it had at the turn of the century, and many cattle owners and animal health professionals believed that the Bureau of Animal Industry would not develop a national eradication program any time soon due to the lack of effective methods of eradication or control and lack of industry support for such a program.

Undulant Fever and *Brucella*, the Relationship Between Human and Animal Disease

Research on Bang's bacillus and contagious abortion conducted at the Department of Agriculture in the early twentieth century impacted not only the cattle industry and animal disease control, but also human medicine and public health. In 1911, Ernest Charles Schroeder and W.E. Cotton presented their work on Bang's bacillus as part of the Bureau of Animal Industry's annual report.[102] They found that cows eliminated the bacteria in their milk, even those who had never aborted or seemed otherwise healthy. Subsequent work by researchers at the BAI, state experiment stations, and land-grant universities confirmed the presence of the abortion bacillus in raw milk including certified milk.[103] This raised the question of whether the bacteria caused disease in humans. Research in the 1910s indicated that injecting guinea pigs with *Bact. abortus* resulted in the development of lesions and enlargement of the spleen along with other abnormalities of the bone, liver, and kidneys.[104] In addition,

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"Editorial Comment – Contagious Abortion," *Hoard's Dairyman* 74, no. 8 (1929): 410.

[102]E.C. Schroeder, and W.E. Cotton, "The Bacillus of Infectious Abortion Found in Milk," in *Twenty-Eighth Annual Report of the Bureau of Animal Industry* (Washington, D.C.: The United States Department of Agriculture, 1911), 139-146.

[103]Alice C. Evans, "Bacillus abortus in Market Milk," *Journal of the Washington Academy of Science* 5, no. 4 (1915): 122-125.

Marshal Fabyan, "A Note on the Presence of B. abortus in Cows' Milk," *Journal of Medical Research* 28 (1913): 85-87.

[104]Bang had not assigned a scientific name to his bacillus, but later researchers often labeled it *Bacteria abortus* or *Bacillus abortus* since it was a bacillus that caused contagious abortion.

Alice C. Evans, "Further Studies on Bacterium Abortus and Related Bacteria: I. The Pathogenicity of Bacterium Lipolyticus for Guinea-Pigs," *The Journal of Infectious Diseases* 22, no. 6 (1918): 576-579.

J.P. Sedgwick and W.P. Larson, "Further Studies on the Epidemic Abortion Reactions in Children," *American Journal of Diseases in Children* 10, no. 3 (1915): 197-200.

the guinea pigs tested positive as reactors to the Bang's bacillus.[105] Researchers then attempted to find links to human health though that proved difficult since they did not have a set of symptoms to observe and testing only indicated if people had been exposed to the bacillus. Some researchers attempted to link contagious abortion with miscarriages by women living in areas with active outbreaks of the disease, but not enough cases existed to draw any conclusions.[106] Many tested infants and children, the primary consumers of raw milk, but no conclusive evidence of pathogenicity came from these experiments.[107] Some children with enlarged spleens tested as reactors but many who tested as reactors seemed healthy and free of any diseases. Medical and public health researchers ran into the same problem that veterinary medical researchers and farmers often had with testing their cattle; a child tested as a reactor but had no symptoms or evidence of any active infection. As a result, these scientists hypothesized that the children in the experiments had been exposed to the contagious abortion germ through raw milk which accounted for the positive reaction to compliment fixation or agglutination testing.[108] Since the tests did not determine active infection only exposure to the bacteria, no conclusions could be drawn based on the studies except that humans could be exposed to abortion bacteria through the consumption of raw milk. Researchers in the 1910s speculated about the relationship of contagious abortion and human disease, but without a defined set of symptoms, a specific infected population to study, or a method of determining active disease, they had difficulty determining if Bang's bacillus posed a health risk to humans.

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[105]Schroeder and Cotton.
L.H. Cooledge, "Facts Disclosed in a Study of the Presence of Bact. Abortus (Bang) in Milk by Means of the Agglutination Test," *The Journal of Medical Research* 37, no. 2 (1917): 207-14.
Karl F. Meyer interviewed by Edna Tartaul Daniel (1961, 1962): 70-72, Regional Oral History Office, University of California San Francisco Archives.
[106]Sedgwick and Larson, 199.
[107]Ibid.
Matthias Nicoll and Josephine S. Pratt, “Does the Bacillus Abortus (Bang) Infect Man?,” *American Journal of Diseases in Children* 10, no. 3 (1915): 203-204.
E.C. Fleischner, and K. F. Meyer "The Bearing of Cutaneous Hypersensitiveness on the Pathogenicity of the Bacillus Abortus Bovinus,” *American Journal of Diseases in Children* 16, no. 4 (1918): 268-273.
[108]Sedgwick and Larson.

The conceptualization of Bang's bacillus and its pathogenicity in humans changed in 1918 when *The Journal of Infectious Diseases* published two papers by Alice Evans, a researcher at the Dairy Division of the Bureau of Animal Industry. In these papers, she claimed that *Bacillus abortus*, the causal organism for contagious abortion, and *Micrococcus melitensis*, the causal bacteria for Malta fever were nearly indistinguishable from each other morphologically, culturally, biochemically, and serologically.[109] Due to this relationship, Evans raised the question of whether the abortion bacteria caused a human disease like Malta fever. Initially most researchers working in both human and animal health rejected Evans's conclusion about the relationship of the two bacteria.[110] Not until 1920, when a researcher from University of California, Karl F. Meyer, published his work confirming Alice Evans' conclusions did researchers begin to accept the idea of *Bact. abortus* and *M. melitensis* being nearly identical and difficult to distinguish from each other.[111] As a result, scientists investigated the epidemiology of Malta fever cases in the United States, hoping to learn more about the rate of infection due to abortion bacteria exposure. By linking the two germs, bacteriologists had a way to trace the possible pathogenicity of the abortion bacillus by examining and testing patients with a specific disease and then tracing the possible source that caused it.

In the early 1920s, most physicians and public health researchers thought of Malta fever as an exotic, rare illness. Extensive studies on the disease done by British military officials stationed at Malta

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[109]Evans, “Further Studies on Bacterium Abortus and Related Bacteria: I.”
Alice C. Evans, "Further Studies on Bacterium Abortus and Related Bacteria: II. A Comparison of Bacterium Abortus with Bacterium Bronchisepticus and with the Organism which Causes Malta Fever," *Journal of Infectious Diseases* 22, no. 6 (1918): 580-593.

[110]K.F. Meyer, and E. B. Shaw, "A Comparison of the Morphologic, Cultural and Biochemical Characteristics of B. Abortus and B. Melitensis: Studies on the Genus Brucella Nov. Gen. I," *Journal of Infectious Diseases* 27, no. 3 (1920): 173.
Rita Colwell, "Original Contributions - Alice C Evans: Breaking Barriers," *The Yale Journal of Biology and Medicine* 72, no. 5 (1999): 353.

[111]Meyer had already investigated the possible pathogenicity of the abortion bacillus in human including comparing the spleen lesions of guinea pigs infected with Bang's and humans who had Malta fever. Meyer suggested naming the new genus of bacteria *Brucella* in honor of Sir David Bruce who had first reported the causal agent of Malta fever. The two species identified by Evans became known as *Brucella abortus* and *Brucella melitensis.*
Meyer and Shaw.
Karl F. Meyer interviewed by Edna Tartaul Daniel, 126-128.

in the nineteenth and early twentieth centuries led to the discovery of the causal bacteria and detailed reports of the disease's epidemiology on the island.[112] These studies found that British soldiers contracted the disease from drinking raw goat milk and that the disease existed as an endemic disease among the general Maltese population due to their exposure to goats. Between the assumptions that a specific bacteria caused the disease, that people contracted it from goat milk, and the fact that the name Malta fever tied it to a certain geographical region, most human health workers in the United States did not expect to come in contact with cases of Malta fever.[113] In addition, the symptoms of Malta fever were extremely similar to other diseases like typhoid, tuberculosis, and malaria.[114] Physicians and researchers in the United States uncovered some cases of the disease using the agglutination test developed by the Royal Army Medical School and other cases that directly related to infected goats.[115] Cases had been detected in the Pecos Valley of Texas, an area with endemic goat fever, though physicians and veterinarians struggled to diagnose human and goat patients outside of agglutination testing.[116] Researchers and physicians thought Malta fever may be more widespread in the United

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[112]Alice C. Evans, "Comments on the Early History of Human Brucellosis" in *Brucellosis: A Symposium Under the Joint Auspices of National Institutes of Health of the Public Health Service, Federal Security Agency, United States Department of Agriculture, National Research Council. September 22-23, 1949, Bethesda, Maryland* 1-8 (Washington, D.C.: American Association for the Advancement of Science, 1950).
D. J. Vassallo, "The Corps Disease: Brucellosis and its Historical Association with the Royal Army Medical Corps," *Journal of the Royal Army Medical Corps* 138 (1992): 140-150.

[113]P.W. Bassett-Smith, "Mediterranean Or Undulant Fever," *The British Medical Journal* 2, no. 3228 (1922): 902-905.
Theobald Smith, "The Relation of Bacillus Abortus from Bovine Sources to Malta Fever," *The Journal of Experimental Medicine* 43, no. 2 (1926): 207.

[114]Charles F. Craig, "Malta Fever: Its Occurrence in the United States Army, With a Review of the Literature," *The American Journal of the Medical Sciences.* 125, no. 1 (1903): 105-106.

[115]Ibid.
"Malta Fever in Texas," *The Journal of the American Medical Association* 33, no. 9 (1911): 746.
Vassallo, 143.

[116]While medical health professionals had identified cases of goat caused Malta fever in areas with high concentrations of goats, most goat owners, their physicians, and their veterinarians did not think of the disease as a possible public health problem leading to an outbreak of Malta fever caused by *B. melitensis* in Arizona in 1922.
Thomas L. Ferenbaugh, "Endemic Mediterranean (Malta Fever) in Southwest Texas," *Journal of the American Veterinary Medical Association* 59, no. 9 (1911): 730-731.
Ernest R. Gentry, and Thomas L. Ferenbaugh, "Endemic Malta (Mediterranean) Fever in Texas with the Isolation of the Micrococcus Melitensis from Two Patients," *Journal of the American Veterinary Medical Association* 59, no. 13 (1911): 889-891.
Ernest R. Gentry, and Thomas L. Ferenbaugh, "Endemic Malta (Mediterranean) Fever in Texas," *Journal of the American Veterinary Medical Association* 59, no. 13 (1911): 1045-1048.

States, but the lack of knowledge about the disease among the medical community and the difficulty of diagnosing the disease remained a problem for most physicians and researchers who hoped to learn more about its prevalence in the United States.

By the mid-1920s, researchers had targeted cases of Malta fever as possible cases of a disease caused by *Brucella abortus* rather than *Brucella melitensis*. In 1924, C.S. Keefer became the first to confirm a case of Malta fever caused by the Bang's bacillus and in the next few years, researchers and physicians around the world reported cases of Malta fever caused by exposure to *B. abortus* infected cows and their milk.[117] Since no serological difference existed between the two bacteria, medical health professionals used the same agglutination test as before to diagnose cases of the disease then cultured the causal bacteria from the patient's blood or urine and relied on the patient's testimony about their contact with raw cow or goat milk or the animals to determine what bacteria led to the infection.[118] By

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W. Warner Watkins, and G.C. Lake, "Malta Fever," *Journal of the American Veterinary Medical Association* 89, no. 19 (1927): 1581-1584.

[117] At first researchers primarily associated abortus based Malta fever with exposure due to raw milk, just like the goat variety. In 1922, Alice Evans contacted the disease in the laboratory setting but she remained undiagnosed for years. Despite her constant exposure to both the abortus and melitensis bacteria during her work, for a few years her physicians kept insisting the disease was the result of hypochondria rather than an actual infection.
Theobald Smith, "The Relation of Bacillus Abortus from Bovine Sources to Malta Fever," 207.
C.S. Keefer, "Report of a Case of Malta Fever Originating in Baltimore," *Bulletin of the Johns Hopkins Hospital* 35 (1924), 6-14.
Alice C. Evans, "Human Infections with Organism of Contagious Abortion of Cattle and Hogs," *The Journal of the American Medical Association* 88, no. 9 (1927): 630-632.
Thomas G. Hull, and Luther A. Black. "Undulant Fever as a Public Health Problem," *The Journal of the American Medical Association* 88, no. 7 (1927): 463.
Paul F. Orr, and I. F. Huddleson, "An Epidemiological Study of Undulant Fever in Michigan," *American Journal of Public Health.* 17, no. 12 (1927): 1242-1247.
Sid Abel, *Script for Brucellosis (Production no. 1073): First Revision* (Washington, D.C.: Motion Picture Service, Office of Information, United States Department of Agriculture, 1949), 40.

[118] In addition to determining the cause of Malta fever, culturing the causal bacteria and patient histories identified another source of human infection, swine. Initially researchers thought swine might also carry *Brucella abortus* or *melitensis*, but eventually in the 1930s they identified another type of the bacteria carried by swine, *Brucella suis.* It was also nearly identical to the other *Brucella* species and required culturing and patient histories to establish it as the causal bacteria.
Theobald Smith, "The Relation of Bacillus Abortus from Bovine Sources to Malta Fever," 207.
"Malta Fever in the United States and its Relation to Cow's Milk," *American Journal of Public Health.* 14, no. 6 (1924): 519.
"Human Infections with Bacillus Abortus," *The Journal of the American Medical Association* 84, no. 14 (1925): 1047-1048.
C. M. Carpenter, and H. E. Merriam, "Undulant Fever from Brucellosis Abortus," *The Journal of the American Medical Association* 87, no. 16 (1926): 1269.

the late 1920s, most medical health researchers accepted the conclusion that *B. abortus* caused cases of Malta fever in humans along with similar germs carried by goats and swine. This shifted the conceptualization of Malta fever from an exotic disease of the Mediterranean to one that could be widespread in the United States and other countries with large cattle populations. This led to researchers advocating a name change for the disease. The name Malta fever implied that the disease only occurred on the island or came from the island when in fact it had been reported in countries across the world.[119] In addition, since the late nineteenth century, the name Malta fever had been synonymous with goats and *M. melitensis*. Those who wanted to change the name of the disease hoped medical health professionals would disassociate the disease from a particular location, a specific animal, and a bacterium that had been renamed. The name undulant fever had already been suggested by a member of the British Malta fever commission in 1887 as a suitable replacement name. Rather than providing a geographical description, the name undulant fever described the main clinical feature of the disease.[120] By the late 1920s, most medical professionals around the world had adopted the name undulant fever. The new name served as a unique descriptor of the disease itself and freed it from earlier conceptualization of the etiology and epidemiology of the infection.

A growing number of undulant fever cases continued to be reported in the late 1920s as more physicians and researchers utilized agglutination testing and culturing to determine if patients had typhoid, malaria, tuberculosis, undulant fever, or some other disease. The diagnosis of undulant fever relied heavily on laboratory findings.[121] Researchers and physicians ordered an increasing number of

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Report to Offices of the Commonwealth Fund for the Chairman of the Committee on Infectious Abortion, National Research Council (1930): 3, AR 59-1, Carton 23, Folder 173, no. 2, University of California San Francisco Archives. A.V. Hardy, "Appendix 4, Undulant fever in the United States," in *Report to Offices of the Committee on Infectious Abortion 1928-29, March 18, 1929* (1939): 2-3 AR 59-1, Carton 23, Folder 173, no. 2, University of California San Francisco Archives.

[119]Bassett-Smith, 903.

[120]"Undulant Fever. An Appeal For The Discontinuance Of Geographical Designations," *The British Medical Journal* 2, no. 3493 (1927): 1158.

[121]During the 1920s, researchers worked to determine the best method of testing and how to standardize it for more accurate

patients with chronic fevers to undergo agglutination testing for undulant fever in order to determine if they had the disease. While this increase in testing indicated that many cases of undulant fever went undiagnosed, it yielded only a relatively small number of people who tested as reactors compared to the number of people who drank raw milk in the United States.[122] Many researchers had expected an epidemic of undulant fever infection due to the high rate of contagious abortion infection in the United States cattle population and the rate of raw milk consumption. Some speculated that *B. abortus* was less pathogenic in man than *B. melitensis,* while other scientists thought that many acute cases of the disease went undiagnosed and therefore untested, or they believed that other less common sources of exposure might be the primary avenue of infection.[123] By the end of the 1920s, most medical professionals recognized the potential public health problem of undulant fever but wanted more studies to determine the scope and epidemiology of the disease. Most encouraged educating physicians about undulant fever and clinical testing in order to ensure that most cases were correctly diagnosed and many promoted pasteurization as a method of reducing the risk of infection from raw milk.[124] The majority of public health and medical professionals wanted to control the infection in humans but wanted more information on the epidemiology of the disease before suggesting any course of action

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reporting of undulant fever. This included extensive studies on agglutination testing and culturing processes. Without accurate and consistent testing it became difficult to diagnose undulant fever.

"Human Infections with Bacillus Abortus," 1047-1048.

C.C. Young, and Alice C. Evans, "Laboratory: Laboratory Procedures for the Diagnosis of Undulant (Malta) Fever," *American Journal of Public Health* 17, no. 4 (1927): 399.

Committee on Infectious Abortion of the National Research Council, "Minutes of the Second Meeting: September 17, 1927," (1927): 1, AR 59-1, Carton 23, Folder 174, no. 2, University of California San Francisco Archives.

[122]Hull and Black.

"Abortion in Cattle and Malta Fever," *American Journal of Public Health* 17, no. 12 (1927): 1250-1251.

[123]"Malta Fever in the United States and its Relation to Cow's Milk."

"Abortion in Cattle and Malta Fever."

Hardy, 1-3.

Theobald Smith, "An Address on the Decline of Infectious Disease in its Relation to Modern Medicine," *Canadian Medical Association Journal* 19, no. 3 (1928): 285-286.

"The Prevalence of Undulant or Malta Fever," *The Journal of the American Medical Association* 90, no. 25 (1928): 2020.

[124]Orr and Huddleson.

"The Prevalence of Undulant or Malta Fever."

"Malta Fever in the United States and its Relation to Cow's Milk."

"Abortion in Cattle and Malta Fever."

outside of pasteurization since they did not want to jeopardize American animal industries and their economies.[125]

While professionals working in human health focused on raw milk as the primary source of undulant fever and investigated the prevalence of the disease, those in veterinary medicine and cattle owners cautioned against taking action too quickly or hastily creating a control or eradication program before a greater scientific understanding of the relationship of undulant fever, contagious abortion, and raw milk had emerged. Some industry groups, agricultural journals, and veterinary medical officials had recommended that dairy cattle owners pasteurize their milk to protect against undulant fever, but no calls for eradicating contagious abortion from herds arose because of the concern over human infections.[126] In a March 1929 report to the National Research Council, John Mohler, the head of the Bureau of Animal Industry, noted that while the same bacillus caused contagious abortion and most cases of undulant fever, only a small portion of milk drinkers ever contracted the disease indicating that only specific strains caused infection or only certain susceptible people developed undulant fever. He advocated for control of contagious abortion as an animal disease problem, but worried that developing an eradication program based on human health concerns would result in a repeat of the tuberculosis eradication program experience that had little initial industry and scientific support.[127] At the same meeting, an industry representative from *Hoard's Dairyman* echoed the same concern of laying the blame for undulant fever on raw milk and suggested that the current movement to eradicate contagious abortion and pasteurization would eventually eliminate any incidental cases of infection from raw milk.[128] Undulant fever and human public health played almost no role in the desire of veterinary

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[125]Hardy, 3.
[126]"Editorial Comment – Contagious Abortion," *Hoard's Dairyman* 73, no. 7 (1928): 396.
Cattle Raisers Association of Texas, 70.
[127]J.R. Mohler, "Appendix 1: The Need for an Enlarged Program in Abortion Investigation," in *Report to Offices of the Committee on Infectious Abortion 1928-29, March 18, 1929* (1929): 1, AR 59-1, Carton 23, Folder 173, no. 2, University of California San Francisco Archives.
[128]A.J. Glover, "Appendix 3: Infectious Abortion as it Affects the Dairy Industry," in *Report to Offices of the Committee on*

health officials, veterinarians, and cattle owners to rid herds of the disease. Instead, the economic burden of contagious abortion drove those interested in eradication. Members of the dairy industry also cautioned health officials that it "[was] not necessary to alarm the public concerning the danger of milk being a carrier of infection which produces undulant fever, since we have so little evidence to substantiate any such danger."[129] Producers worried that alerting the general population about undulant fever and its relationship with raw milk might result in similar consumer pressure that pushed the industry into the TB eradication program. Most of the public remained unaware of the shifting perception in the medical community of the disease from a geographically limited caprine zoonosis to a more common bovine zoonosis that related to a prevalent cattle disease. With no ideal method of eradication available, cattle owners wanted no state or federal programs created based on public demands for Bang's bacillus eradication. While they acknowledged the problem of undulant fever and raw milk, both BAI officials and members of the dairy industry did not want to repeat a fight similar to the one over bovine tuberculosis eradication in late nineteenth and early twentieth centuries. Many hoped that further research on both undulant fever and contagious abortion would lead to effective control of undulant fever without forcing the entire industry into a mandated eradication program due to concerns over human health and without consideration to the economics of the cattle sector.

At the end of the 1920s, most medical researchers, veterinary medical professionals, and cattle owners accepted that *B. abortus* caused undulant fever in humans exposed to raw milk or infected animals. However the lack of knowledge over the epidemiology of undulant fever, the prevalence of the infection in humans, and the incidence of the disease in relationship to the rate of contagious abortion infection in the cattle population made most involved in public health, animal disease control, and the cattle industry weary of creating any Bang's bacillus eradication program in cattle to control

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Infectious Abortion 1928-29, March 18, 1929 (1929): 1-2, AR 59-1, Carton 23, Folder 173, no. 2, University of California San Francisco Archives.

[129]Glover, 2.

undulant fever in man. Instead, those who wanted eradication in herds advocated for it on the basis of economic well-being for individual herd owners. Eradication was already a tough sell on economic grounds due to the cost of testing, sanitation, and the risk of reinfection and most cattle owners wanted it to remain a voluntary option for those who desired contagious abortion eradication. Most veterinary and human health professionals and cattle owners wanted more scientific research conducted to better understand both diseases and the best method of prevention, treatment, and cure for both humans and cattle. They hoped that this would lead to an effective method of disease control or eradication in both populations.

Conclusion

During the mid-nineteenth century, cattle owners, researchers, and medical professionals who dealt with animals began to differentiate between isolated abortion events and clusters of abortions among their pregnant cattle. These abortion storms seemed to be contagious and caused by some unidentified factor that induced cows to birth their calves prematurely. Using the principles of scientific agriculture adopted by the Department of Agriculture and many farmers in the nineteenth century, people concerned about the problem of contagions abortions began to research the possible cause and cure for it. Initial studies failed to find the reason some herds had high rates of abortions though many medical professionals and cattle owners had their own theories about the origins of the condition and suggestions for cures or preventatives involving the care of the cows, sanitation, chemicals, or patent medicines.

The advent of germ theory and the use of new laboratory techniques allowed Danish veterinarian Bernhard Bang to isolate the bacterium responsible for contagious abortion in the 1890s. Though researchers at the Bureau of Animal Industry, universities, and experiment stations were unsure if the same bacteria caused bovine abortions in the United States, they believed that some type of

bacteria most likely caused the disease. In response, many of these agencies began recommending sanitation routines that isolated possible infected animals to prevent the spread of any casual organism. The acceptance of abortion storms as a contagious disease caused by one species of bacteria raised the profile of the disease in many parts of the animal disease research community and the dairy cattle industry in the early twentieth century leading to an increase in research on contagious abortion and the desire to eradicate it. As knowledge about the etiology of the disease grew in the 1910s and conclusive proof that the Bang's bacillus caused contagious abortion in the United States emerged, the BAI and experiment stations produced literature for cattle owners about the cause of the disease and how to eliminate it in their herds to increase productivity. Protocols for creating and managing clean herds developed not only through the bureau and experiment stations, but also individual cattle owners who had eliminated Bang's in their herds. These methods of eradication often included a combination of sanitary measures, quarantines, and testing.

The development of contagious abortion eradication plans by both government researchers and farmers was part of a larger collaborative agricultural science community during the late nineteenth and early twentieth centuries. Research into contagious abortion and the spread of information about the cause of the disease, methods of prevention, and cures was not exclusively the domain of those working in the federal and state agricultural research network. Cattle owners acted as scientists as well and made their herds into laboratory spaces. Some cattle owners tested potential preventatives and cures including chemical compounds, plant-based additives, patent medicines, and vaccines on their own herds. They then reported back to each other through word-of-mouth, agricultural societies, and trade journals. These farmers often worked with experiment stations and requested that their local stations and land-grant universities experiment with their cures, eradication methods, or prevention methods so that these programs or plans could be tested using the scientific method. Since lay cattle owners usually did not possess advanced degrees or operate using scientific study practices such as

control herds, cattle owners and researchers often differentiated between work on Bang's conducted by laymen and researchers at the Bureau of Animal Industry, universities, and experiment stations. Techniques developed by cattle owners constituted practical experience in the field while techniques developed by trained researchers at public institutions constituted scientific testing. While their experience and research methods varied, both groups experimented with cattle herds to determine the best program to prevent the spread of contagious abortion and they exchanged ideas about contagious abortion and its control. These two groups both contributed to the growing knowledge set about Bang's and how to eradicate it in cattle.

Some cattle owners, particularly dairy cattle owners, tried to control the disease in their herds during the 1910s and 1920s, though many cattle owners opted to do nothing or only implement some aspects of control programs. These cattle owners thought that the prevention of contagious abortion outweighed the cost of an endemic infection of the disease in their herds due to the high cost of isolating reactor cattle or killing them. Many of the herd eradication programs required cattle owners to make expensive sanitation improvements on their property or pay to test all cattle for exposure to the Bang's bacillus. While testing made it possible to cull cattle that had been exposed to Bang's, many cattle owners thought that the testing condemned productive cattle. Often reactor cattle showed no visible evidence of infection and could still be good milkers or produce calves. Since having an abortion remained the only symptom of the disease, testing for contagious abortion seemed to condemn healthy cattle including bulls and calves. This created a disconnect between the diagnosis that testing provided and what cattle owners saw and experienced with their herds. As a result, many cattle owners refused to test their cattle since they did not want to kill economically viable animals. While testing allowed for the possibility of eliminating all Bang's exposed cattle and truly eradicating the disease in a herd, it placed too high an economic burden on cattle owners since they would have to kill valuable cattle. Cattle owners wanted a scientific solution to the problem of contagious abortion, but they

wanted it to be convenient and cost-effective unlike the programs advocated by many animal health agencies and some cattle owners in the 1910s and 1920s.

The acceptance of germ theory in the late nineteenth and early twentieth centuries and the development of new methods to determine the causal bacteria of a disease impacted not only understanding of animal diseases, but also their relationship to human diseases. Once Bang isolated the contagious abortion bacterium, researchers found that infected cows eliminated it in their milk. Some wondered if the organisms might cause a disease in humans and in 1918 Alice Evans published papers linking Bang's bacillus to the causal bacteria for Malta or undulant fever. Over the next decade, the medical and veterinary community conducted research conclusively linking the diseases and began to explore the epidemiology of undulant fever. This changed the conceptualization of both contagious abortion and undulant fever during the 1920s. Contagious abortion was no longer just a commodities disease in cattle but a potential occupational and consumer health problem and undulant fever was no longer an exotic disease caused by goats but a possibly common, undiagnosed milkborne infection in the United States. The development of germ theory and its adoption in both research communities impacted the understanding of contagious abortion and Malta fever in the early twentieth century and added a new set of stake-holders to the debate over Bang's control and eradication. Public health officials, physicians, and medical researchers now had a reason to participate in the discussions about contagious abortion control and the need for a coordinated eradication program.

Even though scientists, physicians, veterinarians, and cattle owners knew about the potential risk of Bang's infected milk, no serious attempts to create a national eradication program developed in the 1920s. While research shed more light on the relationship of the two diseases, much about the epidemiology of undulant fever and how the disease passed between species remained a mystery. The rate of undulant fever seemed small compared to the rate of raw milk consumption and the rate of Bang's infection. Many researchers in animal and human health, cattle owners, and officials at the

Department of Agriculture wanted more research conducted into the two diseases before undertaking a national eradication program like that for bovine tuberculosis. They hoped that more studies and knowledge could guide the debate over contagious abortion control and prevent the development of an expensive or ineffective eradication program. Just as many cattle owners hoped for a scientific, cost-effective method of controlling Bang's, public health officials and medical scientists hoped for a scientific program to prevent *B. abortus* in cattle from causing disease in humans.

Chapter 3: A Major Minor Disease – The Relationship of Contagious Abortion and Undulant Fever and Its Control, 1929 – 1941

During the 1920s, a growing number of scientists and medical professionals started to believe in a connection between undulant fever and Bang's disease. Alice Evans' theory that the two causal agents belonged to the same genus and that the two bacteria could cause the same symptoms became more accepted during the following decade by the medical community. The rate of reported cases of undulant fever in the United States rose during the 1920s from a mere 25 cases in 1925 to 1301 cases in 1929.[1] The rise in cases reported most likely did not reflect an increase in incidence of the disease, but rather increased awareness of undulant fever. The disease shifted from a rare, tropical illness that required contact with raw goat milk to a disease that only required contact with raw cow milk or diseased cattle or swine and could account for any number of general symptoms.

While the link between Bang's and undulant fever became more accepted by the human and animal medical communities in the 1920s, the general population mostly remained unaware of the possible connection between the two diseases. During the late 1920s and early 1930s, an increase in media coverage of undulant fever started a wave of consumer concern about the safety of milk that drove health professionals and the dairy industry to push for better control of brucellosis in cattle. The desire to control undulant fever and Bang's disease allied experts in animal and human health and led to the policy concept of controlling the disease in cattle in order to control the disease in humans. Despite the common goal of controlling the bacteria, government officials, health experts, and members of the dairy farming community differed in their opinions on the best method of control and eradication, the amount of government involvement, and the reasons for controlling the disease.

Making Milk Bacteria-Free in the Late Nineteenth and Early Twentieth Centuries

[1]Paul de Kruif, “Don't Be Afraid to Drink Milk, if It's Safe,” *Ladies' Home Journal* 47 (1930): 176.

As discussed in the previous chapter, before Alice Evans' connection of Bruce's bacterium and Bang's bacillus, most medical personnel believed the contagious abortion bacterium to be nonpathogenic in humans. By the end of the 1920s, the majority of medical opinion accepted the conclusion that undulant fever and contagious abortion were caused by the "twin brothers" of Bang's bacteria and the Malta fever coccus changing the understanding of both contagious abortion and undulant fever.[2] Bang's disease transformed from being an economic concern for cattle producers to being a health concern for the entire population of the United States.

The rise of undulant fever as a medical concern coincided with larger changes in the dairy industry. During the Progressive Era, knowledge of infectious diseases in milk supplies spurred interest in pasteurization and certified milk. Milk was considered a nutritious drink, especially for children, but health officials recognized the potential for contamination in the product. In the nineteenth century, methods of purification for milk arose from sanitation theory. Milk sellers and public health officials focused on cleaning farms and stores to prevent filth and dirt from falling into milk. The acceptance of germ theory shifted the way health experts thought about milk purification and disease prevention.[3] Public health reformers looked for a way to kill bacteria that could be transmitted to humans from cows by milk.[4] Two different systems of disease control for milk developed in the United States in the twentieth century, pasteurization and certified milk.

Pasteurization gained acceptance in Europe in the 1880s, but remained unpopular in the United States. Cooked milk was seen by many physicians, mothers, and law makers as a way to mask dirty cows and farms. By treating milk to kill bacteria, the underlying problem of diseased animals and

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[2]Paul de Kruif, "Before You Drink a Glass of Milk," *Ladies' Home Journal* 46 (1929): 169.
C.M. Carpenter and M.J. King, "*Brucella* Abortus in Milk and Its Relation to Undulant Fever," in *Undulant Fever Symposium*, ed. American Public Health Association (Lancaster, PA: Lancaster Press, 1929), 1 – 12.

[3]Alan Czaplicki, "'Pure Milk Is Better than Purified Milk': Pasteurization and Milk Purity in Chicago, 1908-1916," *Social Science History* 31, no. 3 (2007): 412 – 413.

[4]These bacteria included the causal agents for tuberculosis, typhoid, scarlet fever, and diphtheria.
Anne Mendelson, "'In Bacteria Land': The Battle over Raw Milk," *Gastronomica: The Journal of Food and Culture* 11, no. 1 (2011): 37.

unsanitary dairy producers remained. It allowed farmers in both cities and the countryside to keep their cows in small, unventilated milking stalls instead of letting them out to pasture. Sunlight and free space were seen by many health and cattle experts as essential to the health of the cattle and therefore the healthfulness of the cattle products.[5] A few reformers in the 1890s, such as philanthropist Nathan Strauss, privately supplied organizations and cities with pasteurization equipment, but most early Progressive Era reformers believed pasteurization just hid the underlying problem of dirty producers.[6] Unlike in Europe, no federal, state, or city pasteurization programs or laws developed in the late nineteenth century.

Most Americans preferred the other method of milk-borne disease control, certified milk. This concept started in the United States with the establishment of the Medical Milk Commission in 1893.[7] The milk commissions employed research physicians and utilized new bacteriologic testing to monitor the health of cows and the bacteria count of milk. Participating dairies had their facilities, cattle, and product regularly inspected and tested by city milk commissions. Only the dairies and milk that passed the bacteria and production standards gained the label certified milk.[8] Certified milk appealed to consumers by emphasizing the use of science and sanitation to guarantee not just the cleanliness of the milk, but also the cleanliness of the cows, the dairy farm, and the process of production.[9] It cost more than non-certified raw milk, but that did not deter many consumers. Dairies paid the certifying expense because the "clean" label could boost sales and allowed a dairy to charge more for its product.

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[5]Susan D. Jones, "Mapping a Zoonotic Disease: Anglo-American Efforts to Control Bovine Tuberculosis before World War I," *Osiris* 19 (2004): 136 - 137.
William Horne, "Veterinary," *Hoard's Dairyman* 24 no. 27 (1894): 762.

[6]Mendelson, 37.

[7]Reorganization Committee of the American Association of Medical Milk Commission, "Proposed Revision of Methods and Standards for the Production of Certified Milk," (1936): 41, AR 59-1, Carton 36, Folder 272, University of California San Francisco Archives.

[8]"Certified Milk: Requests of the Milk Commission of the San Francisco County Medical Society," (1917), AR 59-1 Carton 18, Folder 140, no. 1, University of California San Francisco Archives.

[9]The use of science and sanitation to market goods to consumers was a trend during the Progressive Era as part of a response to the acceptance of germ theory.
Nancy Tomes, *The Gospel of Germs: Men, Women, and the Microbe in American Life*, (Cambridge: Harvard University Press, 1998).

Certified milk remained popular in the early twentieth century, but pasteurization gained more support as part of an effort to control the spread of bovine tuberculosis and other cattle diseases. In order to prevent tuberculosis, the city of Chicago created the first mandatory pasteurization law in 1908, though the law faced many challenges before being reinstated in 1916. New York, Philadelphia, Milwaukee, Boston and San Francisco created their own pasteurization laws in the 1910s.[10] While cities implemented pasteurization laws, milk in rural and suburban areas remained unregulated in the early twentieth century.[11]

Pasteurization laws spread to more areas in the 1920s as more counties and cities began to pass milk sanitation laws. In addition, the economics of milk shifted creating more demand. Large dairies and dairy collectives made pasteurization cheaper and easier, pushing out smaller farms that provided raw milk.[12] By 1927, 874 cities had pasteurization laws.[13] While the federal government struggled to legally create pasteurization laws due to the local nature of dairy production and sale, it got more involved in an advisory role during the decade. In 1924, the United States Department of Agriculture upgraded its Dairy Division to the Dairy Bureau to monitor and work with the dairy industry, and the United States Public Health Service wrote its first draft of what is now the Pasteurized Milk Ordinance to serve as a model for state laws.[14] No state laws passed during the interwar years, but the amount of territory covered by pasteurization laws expanded. By 1930, certified milk accounted for only 2% of the entire American milk supply and many medical professionals were calling for it to be pasteurized as

[10]Czaplicki, 413.
[11]Susan D. Jones, "Mapping a Zoonotic Disease," 141.
[12]Board of Directors of the Certified Milk Producers of America, "Report of the Scientific Research Committee of Certified Milk Producers Association of America," (1930): 1-4, AR 59-1, Carton 36, Folder 272, University of California San Francisco Archives.
Mendelson, 38.
[13]John T. Schlebecker, *Whereby We Thrive: A History of American Farming, 1607-1972*, (Ames: Iowa State University Press, 1975), 272.
[14]C.M. Jones. *One Hundred Years of Inquiry and Innovation: An Illustrated History of the American Dairy Science Association*, (Long Prairie, MN: Banta, 2006), 32 – 33.
Mendelson, 38.

well.[15] Medical experts wanted the rigorous testing and sanitation standards of certified milk, but with the disease prevention insurance of pasteurization. The concept of clean, healthy farms producing clean, healthy milk and the trust in science and sanitation still existed, but medical and consumer knowledge of the disease prevention ability of pasteurization drove the desire for pasteurized milk. Many health officials still recommended raw milk for children due to the debate over pasteurized milk's nutritional content, but the popularity of pasteurized milk rose during the 1920s.[16] By the end of the decade, pasteurized milk accounted for roughly half of the United States milk supply.[17]

Public Awareness of Undulant Fever and *Brucella*

Understanding of Bang's disease and its relationship with undulant fever changed for many researchers and human and animal medical professionals in the 1920s. For the most part, the general public was not aware of the newly discovered relationship of these two diseases and their causal organisms. Undulant fever and Bang's disease entered public conscious with the publication of an article by Paul de Kruif on the work of Alice Evans in a 1929 issue of *Ladies' Home Journal*.[18] A trained microbiologist and writer of the best-selling book, *Microbe Hunters*, de Kruif's article questioned the safety of American milk and the work of the medical research community on *Brucella* disease, sparking public interest in undulant fever and how to prevent it.[19] This interest by the American public changed the way undulant fever was diagnosed and perceived as a threat to the health

[15]"Report of the Scientific Research Committee of Certified Milk Producers Association of America," 3-4.
[16]Ibid.
[17]Roughly half of the milk supply in the United States was pasteurized by 1930 and about 2% of dairy farmers were in a certified milk program. The remaining milk supply in the country was unpasteurized and usually sold under lower grade labels than certified or pasteurized milk.
"Pasteurized Milk Labels Called Fake," *New Orleans Item*, March 19, 1929.
[18]de Kruif, "Before You Drink a Glass of Milk."
[19]The editors of the *Ladies' Home Journal* often printed articles focused on science and how it could help mothers looking after the health of their families. They saw de Kruif's article on undulant fever as a major scoop and the subsequent protest over the article as proof that they had uncovered a new health issue.
Paul De Kruif, *Microbe Hunters* (New York: Harcourt, Brace and Co, 1926).
Nancy Tomes, "Epidemic Entertainments: Disease and Popular Culture in Early-Twentieth-Century America," *American Literary History* 14, no. 4 (2002).

of the American population.

In the piece, de Kruif painted a picture of a deadly epidemic that physicians could not handle. The danger laid in a supposedly healthy beverage, milk. De Kruif asked his readers,

> Before you drink a glass of milk, it will be mighty wise for your health, it may even save your life, to ask a simple question. For in American milk today, there lurks a terrible, wasting fever, that may keep you in bed for a couple of weeks, that may fasten itself on you for one, or for two, or even for seven years – that might culminate by killing you.[20]

The article continued with startling statistics, estimating at least 50,000 cases of the disease in the United States and exposing that even certified milk contained the bacteria if the supplying herds had contagious abortion.[21] Ultimately, de Kruif encouraged readers to drink pasteurized milk, the only way to guarantee that the milk they were drinking was free of undulant fever causing organisms.

The article brought undulant fever and contagious abortion to the forefront of the public mind at a time when other more deadly diseases receded in the public consciousness. This process followed a similar pattern to the rise of concern about contagious abortion as a cattle disease as discussed in the previous chapter. By the 1930s, many of the human infectious and chronic diseases of the previous decades had been brought under control by sanitation reforms, new chemotherapies and vaccines, or improved dietary knowledge.[22] With the incidence of more deadly food and waterborne diseases on the decline, undulant fever, a disease that rarely killed and often only caused a few weeks of illness, had room to occupy the front stage of public concern for diseases.

Public concern about disease and the healthfulness of food products developed during the

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[20]de Kruif, "Before You Drink a Glass of Milk."
[21]Ibid.
[22]Tomes, *Gospel of Germs*.
Robert William Reid, *Microbes and Men* (New York: Saturday Review Press, 1975).
W.R. Akroyd, *Conquest of Deficiency Diseases: Achievements and Prospects* (Geneva: World Health Organization, 1970).

Progressive Era. Popular reports and works by journalist such as Samuel Hopkins Adams and Upton Sinclair drove interest in the safety of food, medicine, and its production.[23] People wanted to know how their food was made, what it was made of, and if it contained impurities or disease causing agents. Public pressure led to the development of federal policy to monitor and control the purity of food products and drugs in 1906 with the passage of the Federal Food and Drug Act.[24] Progressive Era reformers encouraged public interest and education in food safety. Undulant fever's relationship with milk and the possible threat to the milk supply drove interest in the disease. Years of debate over pasteurization, certified milk, and raw milk marked the product as a potentially dangerous food item that had largely been made safe through sanitation and science.[25] By the late 1920s when the threat of undulant fever made headlines, the American public had been conditioned to worry about the safety of its food supply, especially milk. In addition, increased knowledge of the nutritional value of milk during the 1920s made it an essential food and the threat of disease in a vital food created large amounts of public concern.[26] People wanted assurances and guarantees that any raw milk that they or their children drank was free of disease, including the "new" disease of undulant fever.

The idea that a person could be drinking contaminated milk or have undulant fever without knowing it led people to approach physicians in order to learn more about the disease or get tested for it.[27] The relatively flexible range of symptoms and the lack of definitive testing made undulant fever hard to diagnose.[28] Often undulant fever became a diagnosis of last resort once influenza, typhoid, and

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[23]Samuel Hopkins Adams, *The Great American Fraud: Articles on the Nostrum Evil and Quacks Reprinted from Collier's Weekly* (Chicago: Press of American Medical Association, 1907).
Upton Sinclair, *The Jungle* (London: W. Heinemann, 1906).

[24]"FDA History - Part I," United States Food and Drug Administration, 1999, http://www.fda.gov/AboutFDA/WhatWeDo/History/Origin/ucm054819.htm (2 October 2011).

[25]Mendelson, 37

[26]Ibid., 38.
"Editorial Comment – Undulant Fever," *Hoard's Dairyman* 74, no. 19 (1929): 884.

[27]Fredrick Damrau, "Undulant Fever: What It Is and How It Concerns You," *Good Housekeeping* 90, no. 2 (1930): 94.

[28]Symptoms of brucellosis included but were not limited to weakness, sweating, chills, pain, GI symptoms, insomnia, cough, fever, loss of weight, palpable spleen, and abdominal tenderness.
Brucella bacteria proved to be hard to cultivate and therefore testing for the bacteria was difficult, slow, and expensive. A

tuberculosis were ruled out.[29] For patients with fevers and weakness, but without a positive diagnosis for another disease, undulant fever became a popular diagnosis. The awareness of the disease in the medical and general population changed the conceptualization of undulant fever from a rare, exotic disease to a common food-borne illness, increasing the number of cases diagnosed. Before the late 1920s, physicians ignored the possibility of an undulant fever diagnosis or they did not even know what the disease was or its symptoms. By the end of the decade, undulant fever became an acceptable diagnosis. After the publication of de Kruif's article, patients came to doctors to ask if the disease could be the cause of their fatigue and pain. This drove the number of reported diagnosed cases up from 25 cases in 1925 to 649 cases in 1928 and 1505 cases in 1929.[30] Health officials from every state reported cases with the greatest number in Ohio, Iowa, Missouri, New York and Kansas. Awareness of undulant fever created an epidemic of cases rather than an increase in incidence of the disease.

Debate Over the Epidemiology of Undulant Fever

The *Ladies' Home Journal* article launched public concern about the disease, and in the medical community and the dairy industry, it launched debate on the validity of de Kruif's argument about the

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human serological test for undulant fever existed, but since it tested for the presence of *Brucella* antibodies it could only determine if a person had been exposed to *Brucella*, not if the person had an active infection. In addition, titer results from the test could be interpreted differently by different labs or physicians. As a result, one negative test was not considered enough to determine a person's undulant fever status. People often received results that were neither positive nor negative, but rather suspicious.
I Forrest Huddleson, ed., *Brucellosis in Man and Animals*, revised ed. (New York: The Commonwealth Fund, 1943), 89.
Karl F. Meyer interviewed by Edna Tartaul Daniel (1961, 1962): 130 – 132, Regional Oral History Office, University of California San Francisco Archives.

[29] de Kruif, "Before You Drink a Glass of Milk," 29.
"Lab Report Sheet for Suspected Cases of Undulant Fever in California," AR 91-105, Carton 1, University of California San Francisco Archives.
Meyer Oral History: 130 – 132.

[30] de Kruif, "Don't Be Afraid to Drink Milk," 29.
Leonard C. Blumer, *A Summary of Correlated Facts Concerning Undulant Fever in Humans and Contagious Abortion in Animals: And the Relationship of One to the Other from the Standpoint of Transmission Through Meat and Milk Products*, 2nd ed. (Birmingham: Jefferson County Board of Health, 1930), 19.
Louis Dublin, "Vital Statistics," *American Journal of Public Health* 21, no. 3 (1931): 293.

actual risk posed by raw milk.[31] Medical professionals recognized that most cases went undiagnosed and unreported, but since the disease was so under-reported and the epidemiological study of the illness so new, different medical professionals had different opinions on the possible number of cases and the causes of these cases. Early epidemiological studies conducted by the USPHS, agricultural stations, and land grant universities determined that the majority of infections occurred in men who contracted the disease through contact with diseased animals.[32] Farmers, veterinarians, slaughterhouse workers, and laboratory workers accounted for two-thirds to three-quarters of cases in most areas. These findings indicated to some health professionals that raw milk did not pose a major health risk even if undulant fever was a concern since most cases seemed occupationally related. Prominent animal disease researchers and public health officials such as recently retired head of the Rockefeller Institute, Theobald Smith, and director of the Bureau of Animal Industry, John H. Mohler, questioned the severity of the problem of *Brucella* contaminated milk and its effect on the American public.[33] These prominent health researchers asserted that if milk was the main source of infection in the United States, as de Kruif speculated in his article, that the majority of cases would occur in children, the biggest

[31]"Report of the Scientific Research Committee of Certified Milk Producers Association of America," 3.
"Editorial Comment – Undulant Fever", 884.
"Undulant Fever and Its Relationship to Abortion," *Hoard's Dairyman* 74, no. 19 (1929): 886.
de Kruif, "Before You Drink a Glass of Milk."
Damrau, 94.

[32]Determining the source of infection was often difficult since the three species of *Brucella* could cross-react during testing and cows could contract all three *Brucella* species. A patient could have *B. melitensis* or *B. suis* and still have gotten it from exposure to infected raw cow milk. Patient histories with information on contact with animals and drinking of raw milks were used to try and determine the source of infection for people.
Herman E. Hasseltine, "Study of the epidemiology of undulant fever," *American Journal of Public Health* 21 (1931): 519-525.
James McAlpine and Friend Mickle, "Bacterium abortus infection in man," *American Journal of Public Health* 18 (1928): 609-613.
J. Traum, "Animal infections with bacteria of genus brucella and their relation to undulant fever of man," *American Journal of Public Health* 20 (1930): 935-942.

[33]In his article, de Kruif referred to Smith as "surely the dean of all American microbe hunters," but noted that Smith did not think the presence of contagious abortion bacteria in milk could cause problems in humans.
de Kruif, 9.
E. G. Hastings, "Relation of Infectious Abortion of Cattle to Public Health," *Hoard's Dairyman* 74, no. 5 (1929): 247.

drinkers of raw milk.[34] The epidemiology of the disease allowed researchers and medical professionals to directly attack de Kruif's argument on the danger of the American milk supply.

Many health officials also questioned the article because it alerted the public to undulant fever. These individuals questioned if information on undulant fever should be presented to the public at large. An article in *Good Housekeeping* by a practicing physician who faced questions about undulant fever from his patients directly attacked the science of de Kruif's article and rationale for publishing it.[35] He questioned if the article should have been published since "the modern mother is so thirsty for health knowledge that a mere rumor of danger in milk – often without scientific foundation – is sufficient to alarm her unduly."[36] Many medical officials worried that the article created unnecessary panic in patients and thought that debates and concerns about undulant fever should stay in the medical community. Even public health officials and researchers who supported de Kruif's effort to present Alice Evans' work and alert the public that undulant fever existed worried that "the good done by the de Kruif article is very questionable" due to the "romance, exaggerations and embellishments, and . . . the omissions" in the article. [37] The lack of scientific evidence and the sensationalism of the narrative undercut de Kruif's argument about the danger of undulant fever and need for pasteurization of all milk.

Not all researchers and human health workers rejected de Kruif's argument and his dire warning about the prevalence of undulant fever and the need for pasteurization. Some physicians argued that many of those with assumed occupational cases such as packinghouse workers and farmers also frequently drank raw milk and no tests existed to determine what caused their cases of undulant fever. They also speculated that some people may have a natural immunity to the disease which accounted for the relatively small number of cases compared to the number of people who drank raw milk. They

[34]"Editorial Comment – Undulant Fever," *Hoard's Dairyman* 74, no. 20 (1929): 940.
[35]Damrau.
[36]Ibid., 94.
[37]Traum, 935.

supported de Kruif's call to pasteurize all milk as the only effective means of avoiding undulant fever and other milk-borne diseases.[38] These health researchers looked at the same studies on undulant fever as those who criticized de Kruif's article but drew different conclusions. Health officials on both sides of the issue used the same new studies on the pathology and epidemiology of undulant fever to justify their position on the risk of raw milk.

Debates and critiques of the *Ladies' Home Journal* article were not limited to the health community. Dairy industry representatives and trade journals, including those who supported controlling or eliminating contagious abortion, attacked the article as creating a false panic over the safety of milk.[39] In his article, de Kruif presented his argument that undulant fever threatened families through the milk supply with an air of scientific authority by interweaving Alice Evans' story into the narrative and contrasting it with the perceived indifference of the majority of the medical research community to the disease. This created a perception that the article revealed a hidden threat that most researchers and medical professionals wanted to ignore. Dairy industry groups sought to refute the article by claiming greater scientific authority and existing industry response to contagious abortion. These groups cited the emerging epidemiological evidence to demonstrate that while contagious abortion was a common problem in dairy cattle, undulant fever was not a common problem in milk drinkers. They also pointed to the existing movement to control contagious abortion in dairy cattle that already decreased the prevalence of contagious abortion, making the milk supply cleaner. According to dairy industry groups, alarming mothers about undulant fever caused by raw milk was "unfair as it is unscientific."[40] By directly attacking the science presented in the article and reinforcing the concept that "milk is our essential food, and so much in the last ten years has been done to make it safe and to

[38]"Information and Misinformation Concerning Undulant Fever," *The Journal of the American Medical Association* 94, no. 16 (1930):1238-1240.
[39]"Undulant Fever," *American City* 41, no. 12 (1929): 167.
[40]"Editorial Comment – Undulant Fever," 889.

produce a clean, wholesome supply throughout this country,"[41] the dairy industry tried to protect its product and its reputation against renewed public concern about the safety of the milk supply and the indifference to public safety by dairy producers.

Even though some medical officials and members of the dairy industry sought to refute the narrative in de Kruif's article, they moved towards his goal of more complete pasteurization. The argument for pasteurization to prevent undulant fever existed as part of the large public health movement calling for more pasteurization and elimination of lower grades of milk. Momentum already existed to pasteurize more milk, especially non-certified raw milk. The *American Journal of Public Health*, which published several articles critiquing de Kruif's article, still advocated for pasteurization of all non-certified raw milk and better pasteurization and production standards for lower grade milk.[42] This editorial position was an extension of the Progressive Era public health policy calling for healthier milk supplies through pasteurization and clean production and storage. While many medical professionals and researchers thought that the threat of undulant fever due to milk-borne infection remained low, pasteurization assured that no threat existed. Certified milk councils and organizations sought to eliminate the possibility of milk caused undulant fever by creating new standards for certified milk herds. About 80% of certified dairy herds entered into contagious abortion eradication programs by the summer of 1930, and most county certified milk commissions required constant testing to guarantee disease free milk herds.[43]

The debate about pasteurization continued in the public health community in the 1930s and some cities and municipalities started to require pasteurization of all milk including certified milk, but

[41]Ibid.
[42]"Should Certified Milk Be Pasteurized," *American Journal of Public Health* 20 (1930): 183 – 184.
[43]Karl F. Meyer, "Public Health Control of Infectious Abortion in Certified Milk," *American Journal of Public Health* 21 (1931): 512.

much of the pasteurization debate occurred and existed outside of the debate about undulant fever.[44] Sanitary standards for milk improved in the early twentieth century and continued to grow during the interwar years. Concerns about bovine tuberculosis, increased scientific and mechanized milk production, and the growth of larger dairy collectives made it easier and cheaper for producers to pasteurize milk and for cities to monitor the quality of milk supplies.[45] The elimination of undulant fever causing bacteria became one more advantage of pasteurization but not the driving force behind the movement.

Controlling Undulant Fever and Bang's in the 1920s and the 1930s

While undulant fever did not drive producers and cities to adopt increased pasteurization and while medical officials and researchers along with the dairy industry questioned *Ladies' Home Journal's* decision to publish an article on undulant fever and milk, health professionals in animal and human medicine had not ignored the issue of undulant fever and contagious abortion since the discovery of their relationship in the previous decade. As discussed in the previous chapter, public health officials wanted to eradicate the disease in humans. Even though undulant fever rarely killed, it could cause painful symptoms that kept patients in bed for weeks and sometimes months or years. With most of the deadly epidemics of the early twentieth century controlled or eradicated, the concern for undulant fever moved to the public health forefront as a major minor public health problem.[46] By 1930, undulant fever became a reportable disease in most states as concern about the disease grew. The United States Public Health Service, American Public Health Association, and National Research Council established undulant fever committees and conferences in the 1920s and 1930s to discuss the

[44]de Kruif, "Don't Be Afraid to Drink Milk."
[45]Walter-Gordon News, Promotional Paper for Walter-Gordon Labs and Walker-Gordon System of Milk Production, AR 59-1, Carton 17, Folder 131, University of California San Francisco Archives.
Czaplicki, 415.
[46]Ward Giltner, *Brucellosis: A Public Health Problem*, (East Lansing, MI: University of Michigan, 1933): 33 – 34.

epidemiology of the disease, control efforts, and possible treatments or cures.[47] Most public health officials concluded that controlling the disease in humans would be impossible without controlling the disease in animals. With no evidence of the disease spreading between humans, the only cause of the disease was zoonotic. In addition, no effective treatments for undulant fever emerged. Experiments with serum treatment and vaccines in the late 1920s and with sulfonamide drugs in the mid-1930s yielded few positive results.[48] Many medical officials and researchers thought the milk supply presented a small risk that could be controlled through pasteurization, but undulant fever still existed as an occupational disease for those working with diseased animals.[49] Due to all these factors, most public and veterinary health researchers reached the conclusion that controlling the disease in animals was the only way to prevent the disease in man.[50] Doctors and veterinarians worked together to promote the reduction of *Brucella* in animals in the 1930s.

The desire by health officials to control undulant fever through animal control dovetailed with the dairy industry's increased desire to control contagious abortion during the interwar years. As discussed in the previous chapter, contagious abortion was a significant economic problem for dairy cow owners, resulting in approximately fifty million dollars in lost product each year in the United States.[51] It also created problems for cattle breeders attempting to develop and maintain bloodlines.[52] Most dairy cattle owners and breeders sought any solution to rid their farms of the disease including slaughter of cattle, vaccines, patent medicines, and aggressive sanitation measures.

While both health officials and many cattle owners wanted to control contagious abortion, the

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[47] *Undulant Fever Symposium*, ed. American Public Health Association (Lancaster, PA: Lancaster Press, 1929), AR 59-1, Carton 23, Folder 173 and 174, University of California San Francisco Archives.
[48] A. Eichhorn, "Farmer's Bulletin No. 1871: Brucellosis of Cattle (Bang's Disease, Infectious Abortion)," in *U.S.D.A. Farmer's Bulletins, 1851 – 1875*, 12.
[49] George H. Conn, *Bang's Disease of Cattle* (Webster City, IA: The Fred Hahne Publishing Company, 1941), 65.
[50] Ibid., 69.
[51] Wisconsin College of Agriculture, "Abortion Study in Wisconsin," *Hoard's Dairyman* 74, no. 1 (1929): 52.
[52] John R. Mohler, A.E. Wight, and Elmer Lash, "Benefits of Eradicating Bang's Disease," in *United States Department of Agriculture Miscellaneous Publication No. 384* (Washington D.C.: United States Government Printing Office, 1940), 8. Conn, 50.

rationale and rhetoric for this control differed. Human health officials perceived undulant fever and, by extension, contagious abortion as a public health problem.[53] Veterinary health officials and cattle owners viewed Bang's not as a health problem, but as an economic problem. The disease rarely caused symptoms in cows and heifers outside of abortion, and calves, bulls, and unbred cattle seemed to suffer no symptoms at all. Before testing for the disease began, multiple cows having abortion was the only diagnostic measure. The name of the disease, contagious abortion, encapsulated the problem caused by the infection.

For cattle owners, the loss of a calf and milk production represented commodities losses, distinct and separate from loss of an animal due to disease. Though Bang's disease was known to be a contagious disease since the 1890s, the Bureau of Animal Industry never tried to control it through a national control or eradication program. It provided individual owners with information on the disease and how to control it in agricultural bulletins with the focus on increased production and profit.[54] The federal government treated contagious abortion differently from other infections at the beginning of the twentieth century like tuberculosis, foot-and-mouth disease, and tick fever. These diseases caused death, disfigurement, or other symptoms that directly affected the value of infected animals leading the BAI to create policies that covered the lost value of a destroyed diseased animal. Contagious abortion left no visible mark on the infected animals. Before testing for the disease, cattle with contagious abortion suffered no depreciation in their value. All animal diseases created agricultural economic loss and all animal disease control measures created by the BAI aimed to minimize these losses, but the lack of impact on infected cattle seemed to draw a distinction between contagious abortion and other animal diseases. Once testing for Bang's developed in the 1910s and 1920s, some cattle buyers placed a higher value on Bang's free cattle, but the disease remained an economic problem rather than an animal health

[53]C.M. Carpenter and M.J. King, "Brucella Abortus in Milk and Its Relation to Undulant Fever," *Undulant Fever Symposium*, ed. American Public Health Association (Lancaster, PA: Lancaster Press, 1929), 1 – 12.
[54]Mohler, Wight, and Lash.

problem.

The differences in the rationale behind control of *Brucella* bacteria led to different rhetoric to promote control measures. Health officials investigating undulant fever advocated for Bang's control in animals to prevent human cases. They wanted control of all three species, *B. abortus*, *B. melitensis*, and *B. suis* across all domesticated cattle, goats, and swine in order to prevent milk-borne and occupational undulant fever infections resulting from exposure to diseased animals.[55] They called upon veterinary medicine workers and farmers to end *Brucella* infections for the good of the nation's health and for their own health since these groups were most likely to contract occupational undulant fever.[56] Officials working on undulant fever utilized human health arguments to justify the development of control policy for brucellosis.

For those dealing with the animal disease, discourse on contagious abortion control remained rooted in economics even after the acceptance of the connection between undulant fever and raw milk. Dairy farmers and veterinary medical officials often argued that while zoonotic transmission from raw milk occurred, the rareness of infection from that source did not justify calling Bang's a public health problem.[57] As for concerns about undulant fever as an occupational disease, many cattle owners gave little thought about contracting the illness.[58] The only rhetoric referring to human health in agricultural circles linked it with economics. In the 1930s, dairy farmers

> will attempt its [Bang's] eradication on economic grounds and in solving the economic problem the disease presents, will make their chief product, milk, more acceptable to consumers because of

[55]Huddleson, 285.
Meyer Oral History, 130 – 132.
Report to Offices of the Commonwealth Fund for the Chairman of the Committee on Infectious Abortion, National Research Council (1931): 5, AR 59-1, Carton 23, Folder 173, no. 2, University of California San Francisco Archives.
[56]J.J. Litner, *Bang's Disease and What It Means to the Agricultural Interest of Illinois from an Economic Standpoint* (Springfield: Illinois Farmer's Institute, 1939), 10.
[57]"Editorial Comment – Contagious Abortion," *Hoard's Dairyman* 76, no. 18 (1931): 640.
[58]Conn, 65.

esthetic if not because of sanitary reasons.[59]

Eradicating Bang's in a herd allowed dairies to charge more for their product as certified milk or allowed them to market their milk as contagious abortion free to appeal to consumers.[60] Public health concerns created another economic reason to control Bang's disease for dairy cattle owners rather than developing into an independent reason for control.

Agricultural bulletins, trade journal articles, and communication from government agencies also advocated for control based on economic reasons.[61] With the prevalence of bovine tuberculosis greatly reduced, bovine *Brucella* became the costliest cattle disease in the United States. Cattle and its byproducts accounted for a large part of America's animal economy and controlling contagious abortion could increase dairy and calf production.[62] Little to no educational material for farmers focused on health reasons to control contagious abortion. Bang's disease remained an economic issue rather than a health issue in the agricultural community, despite turning into a human health problem in the 1920s and early 1930s.

State Bang's Control Programs from 1929 - 1941

No local, state, or federal plans or laws developed for Bang's control during the first three decades of the twentieth century due to the prevailing concept of contagious abortion as an economic disease. Even with no official government plans the BAI, state agricultural stations, and universities

[59]E. G. Hastings, "Contagious Abortion Eradication," *Hoard's Dairyman* 76, no. 18 (1931): 640.
[60]Meyer, "Public Health Control of Infectious Abortion in Certified Milk," 513.
H.E. Bechtel, "Menace of Bang's Disease," *Hoard's Dairyman* 76 no. 4 (1931): 130.
[61]Mohler, Wight, and Lash.
John M. Buck, "Farmer's Bulletin 1704: Bang's Disease (Infectious Abortion)," in *Farmer's Bulletin, 1701 – 1725*, ed. United States Department of Agriculture Office of Information Division of Publication (Washington D.C.: United States Government Printing Office, 1934).
Walter Wisnicky, "Bang's Disease in Wisconsin," *Hoard's Dairyman* 80 no. 15 (1935): 385.
[62]*Report to Offices of the Commonwealth Fund for the Chairman of the Committee on Infectious Abortion, National Research Council* (1930): 1, AR 59-1, Carton 23, Folder 173, no. 2, University of California San Francisco Archives.
George W. Pope, "World Prevalence of Livestock Diseases," *The Cattleman* 18 no. 10 (1932): 66.

provided information on herd control plans and conducted research on the disease. However, as discussed in the previous chapter, as knowledge of the etiology and epidemiology of contagious abortion and reliability of serological testing grew in the twentieth century, so did the attempts to create control measures.

By 1929, seven states required testing for contagious abortion before allowing cattle to be shipped into the state.[63] Within a year, twenty six states and one territory created regulations requiring testing of cattle being bought and sold across state lines.[64] In addition, several states began to develop plans to fully eliminate contagious abortion. Research on the reinfection of clean herds indicated that Bang's often returned to herds through introduction of replacement cattle or through neighboring diseased herds.[65] Without a plan to eradicate the bacteria in a whole area, dairy cattle owners found it difficult to keep their individual herd clean. The desire to increase agricultural profit by eliminating the disease led to the development of these new regulations and plans by states.

Introduced in April 1929, Pennsylvania became the first state to create an animal public health response plan to contagious abortion. Dubbed the “Pennsylvania Plan” by the veterinary and dairy cattle communities, it consisted of agglutination testing, sanitary measures, quarantine measures, and rigorous identification programs to certify and keep a herd or an animal free of the disease. It had a test-and-slaughter component like traditional animal disease control programs, but did not mandate the slaughter of reactor cattle. Cattle owners had the option of sending reactors to slaughter or keeping them quarantined. With the federal tuberculosis plan reaching an endpoint, the Pennsylvania Plan utilized the existing mechanisms of the tuberculosis control program to establish a contagious abortion control program. The success of the TB program led officials who supported the state plan to believe

[63]Beatrice Hager, *Summary of Laws and Various States Which Contain Specific Provisions Relating to Contagious or Infectious Abortion of Cattle and Malta Fever* (Madison: Wisconsin Legislative Reference Library, 1930), 1- 8.
[64]“States Requiring Abortion Test,” *Hoard's Dairyman* 75 no. 10 (1930): 547.
[65]Buck, 9.

that a Bang's eradication program could be just as effective. Twelve other dairy producing states rushed to adopt similar measures in 1929 though no states made these programs mandatory for cattle owners.[66] Instead, they sought to cooperate with willing owners and their veterinarians to standardize contagious abortion eradication and control plans. Many of the regulations in the program came from existing USDA plans on how to create and manage a clean herd that individual owners followed. The difference lay in the authority a state plan provided. A herd participating in a state plan fell under the supervision of state animal health officials and required care by a practicing veterinarian.[67] Herds accredited as Bang's free under the state plans carried a disease free guarantee from the state and a guarantee that public health and veterinary officials tested and monitored the animals. Before, milk consumers and dairy cattle buyers had to rely on the word of individual dairy producers, private groups like milk commissions, or individual breeders that their cattle were disease free. State recognized disease free status placed the power of the government behind certification, creating a sense of assurance about its accuracy. State accreditation also allowed breeders and dairy producers to charge more for their products and made it easier for cattle owners to avoid reintroducing contagious abortion to clean herds. Certification by the state of a herd and of an individual animal acted as both a license and a passport for cattle. It designated them as “healthy” or “reactors” and that status determined their ability to be bought, sold, or travel across states.

While dairy cattle owners sought plans and methods to control Bang's in their herds, many initially rejected the Pennsylvania Plan and other similar state plans. The Pennsylvania Plan required herds to be enrolled in the TB eradication plan to participate in the Bang's program.[68] Both programs placed the cost of testing, sanitation control, and quarantine on cattle owners rather than the state or

[66]B.A. Beach, “Can This Problem Be Solved,” *Hoard's Dairyman* 74, no. 8 (1929): 406.
[67]“The Pennsylvania Plan,” *Hoard's Dairyman* 74, no. 9 (1929): 449.
[68]Started in 1917, the success of the federal bovine tuberculosis eradication program led to a dramatic decrease in the prevalence of the disease by 1924. This decline in tuberculosis made contagious abortion the most costly and dangerous disease for cattle owners as discussed in the previous chapter.
John T. Schlebecker, *Cattle Raising on the Plains, 1900-1961* (Lincoln: University of Nebraska Press: 1963): 108.

federal government. Dairy producers worried that between the cost of testing and the impact of quarantining or slaughtering all reacting cows, Bang's control would bankrupt their business.[69] Many veterinarians and dairy producers also questioned if a contagious abortion eradication plan should follow the same path as the TB eradication program. While the two diseases shared similar methods of testing, Bang's required more testing due to a long incubation time and had less reliable serological testing procedures.[70] For tuberculosis testing, one test indicated if the animal had the disease or not, and if it was a reactor, it was destroyed. For Bang's testing, one test could indicate the animal was a reactor, but one test could not confer disease free status. Additionally, one test could result in a "suspicious" titer that placed an animal's status in limbo until the next test. These possibly infected cattle required separate pastures and barns while waiting at least two months for more testing, an additional burden on cattle owners. Any reactors also had to be quarantined separately and kept for pasteurized dairy production or be sent to slaughter. Accredited Bang's free herds generated higher value products, but fear of bankruptcy in the pursuit of this goal held some dairy producers back from joining the state plans.

Not all veterinary health workers and cattle owners who rejected state plans objected based on logistical and economic concerns. Some argued that the lack of epidemiological information and accurate testing for contagious abortion prevented the creation of an effective eradication program.[71] Others preferred that a control program of testing, sanitary care, and quarantine arise from industry rather than government. As dairy producers realized the high cost of keeping cattle with Bang's, they would establish their own eradication programs to rid an area of the disease.[72] Even though no federal programs had been created and state programs remained voluntary, some dairy producers feared the

[69]"Editorial Comment – Contagious Abortion," *Hoard's Dairyman* 74 no. 8 (1929): 410.
[70]Huddleson, 286 – 287.
[71]"Editorial Comment – Contagious Abortion," 410.
[72]"Editorial Comment – Abortion Control," *Hoard's Dairyman* 75, no. 3 (1930): 114.

possible development of mandatory plans or being forced into state plans due to increasingly restrictive testing requirements for transport and sale of cattle. The availability of state accreditation led to New York restricting the interstate import of cattle unless the animals came from an accredited herd in 1932.[73] Dairy farmers worried that other states and individual herd owners would follow suit and leave unaccredited cattle owners only able to sell to other unaccredited herds in their own state.

A new development in Bang's prevention also led veterinary medical officials and dairy cattle owners to question the development of state plans in the early 1930s. Since Bang discovered that contagious abortion was caused by a bacteria, researchers strove to create a vaccine. Bang himself tried to develop an effective killed vaccine for the disease with no success. During the early part of the twentieth century, a number of pharmaceutical companies focused on animal diseases created killed and live strain vaccines. Bacterins, made from inactivated strains, were not potent enough to confer immunity and live strain vaccines were too contagious, causing cases of Bang's and transmitting the bacteria to other cattle. Veterinary medical professionals often lumped both types of vaccines with patent medicines and chemotherapies as false hopes and wastes of money due to their ineffectiveness.[74] Dairy farmers started to demand USDA regulation of vaccines or to ban them altogether until the development of a better vaccine.[75] They wanted similar controls and restriction to what chemotherapies for animals faced.

At the same time as commercial laboratories created and produced vaccines, the USDA and land grant universities also worked on developing a vaccine for Bang's disease. BAI researchers working with different strains of *Brucella abortus* isolated one designated strain 19 in the mid-1920s. After being left on a desk for several years, the strain attenuated and when researchers rediscovered it

[73]"Editorial Comment – New York Ruling," *Hoard's Dairyman* 77 no. 24 (1932): 564.
[74]Buck, 12 – 13.
[75]"Vaccination for Bang's Disease," *Hoard's Dairyman* 79, no. 22 (1934): 492.

at the end of the decade, it made for an ideal vaccine.[76] As a weakened but living organism, strain 19 conferred immunity without causing a full Bang's infection or spreading the bacteria to other animals. Once the BAI began to experiment and report on its success with the vaccine in 1930, other researchers and dairy cattle owners demanded access to the strain 19 vaccine.[77] The bureau did not cave to these demands and instead started small herd tests to determine the best age, dose, and plan for vaccination.[78]

The slow testing program for the new vaccine and other contagious abortion experiments frustrated dairy industry groups. These groups appreciated the work that BAI researchers conducted and desired a contagious abortion eradication program based on scientific evidence but wanted more experimentation at the federal level. Just as they did in the 1920s, these groups successfully lobbied for more funding for the USDA to spend on Bang's research in 1930. However, the BAI rejected this additional money, claiming that the bureau did not have the personnel to effectively utilize more than its current $100,000 appropriated for contagious abortion research.[79] The decline of the veterinary profession and the closing of most of America's veterinary medicine schools had taken its toll on veterinary medical research.[80] Without the personnel to conduct more work, vaccination experimentation started with small numbers of federal or state herds in the early 1930s and slowly

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[76]*The Triple Threat of Brucellosis*, prod. United States Department of Agriculture Office of Public Affairs, 1951, film reel.

[77]Buck, 12 – 13.
"Favors Vaccination from Bang's Disease," *Hoard's Dairyman* 82, no. 1 (1937): 23.

[78]One of the early test herds for the strain 19 vaccine was the prize-winning Holstein herd at San Quentin prison. Reluctant to eliminate contagious abortion from the herd by slaughtering all the reactors due to the high cost of disease free pedigree replacements, prison officials asked University of California researchers for an alternative method of disease control. The prison began vaccinating calves with strain 19 vaccine in 1931. As the new vaccinated calves matured, old cows with Bang's were sent to slaughter. After four years, the vaccination and replacement plan freed the herd of the disease. It became on the first healthy herds developed by using the vaccine and generated nationwide interest in the vaccination and replacement method. In order to protect the health of its inmates, the prison pasteurized its milk while developing a Bang's free herd.
Meyer Oral History, 133 – 134.

[79]"Editorial Comment – Research and Abortion," *Hoard's Dairyman* 75, no. 19 (1930): 886 - 887.

[80]United States Congress Senate Committee on Government Operations, *Veterinary Medical Science and Human Health; Veterinary Activities of Agencies of the United States Government in Relationship to Functions Performed by State and Local Governments, Private Groups, and Intergovernmental Organizations* (Washington D.C.: United States Government Printing Office, 1961), 80.
Ann N. Greene, "The Now-Opprobrious Title of 'Horse Doctor': Veterinarians and Professional Identity in Late Nineteenth-Century America," in *Healing the Herd: Disease, Livestock Economies, and the Globalization of Veterinary Medicine*, ed. Karen Brown and Daniel Gilfoyle (Athens, OH: Ohio University Press, 2010), 44.

expanded to include private herds under the supervision of the BAI or state agriculture experiment stations. The immediate success of these early experiments led the USDA to ban other commercial vaccines by 1932 and made strain 19 available to commercial labs to distribute for use in conjunction with BAI testing.[81] No government programs existed to cover the cost of the vaccine nor did any state control programs center on vaccination in the early 1930s. However, the development of the strain 19 vaccine opened another avenue of control for dairy owners and started a debate on the best method of Bang's control, test-and-slaughter or vaccination, that continued for decades.

By the time the strain 19 vaccine was released in 1932, Bang's control programs had begun to grow and change. Thirty two states adopted the Pennsylvania Plan by 1933 and Pennsylvania had 828 herds certified Bang's free that year.[82] Experimentation in contagious abortion herd plans led to a number of different control plan options for individual cattle owners that fell within the regulations set by different state plans.[83] Many of the dairy farmers who entered state plans experienced success at eliminating Bang's from their herds, helping to settle some of the concerns dairy owners had about the accuracy of testing.[84] Continued education about Bang's, its economic impact, and the number of different herd eradication plans increased dairy industry interest in control of the disease and led to the expansion of control programs.

The expansion of control programs and the growth of Bang's free herds allowed states to create more stringent interstate cattle shipping laws. New York's implementation of a regulation allowing for shipping of cattle only from accredited herds created a turning point in regulation policy. Dairy industry

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[81]J, Traum "The Control of Brucellosis in Animal By the Use of Vaccine," in *Brucellosis, a Symposium Under the Joint Auspices of National Institutes of Health of the Public Health Service, Federal Security Agency, United States Dept. of Agriculture, National Research Council, September 22-23, 1949, Bethesda, Maryland* 225 – 235 (Washington, D.C.: American Association for the Advancement of Science, 1950).

[82]"Leads Abortion Control," *Hoard's Dairyman* 78, no. 9 (1933): 178.

[83]J.B. Fitch and C.H. Kitselman, "Serving an Abortion -Free Herd," *Hoard's Dairyman* 78, no. 7 (1933): 150.
G.P. Deyoe, "Eradicating Bang's Disease," *Hoard's Dairyman* 78, no. 15 (1933): 276.
"Control of Bang's Disease," *Hoard's Dairyman* 79, no. 4 (1934): 68.

[84]Deyoe, 276.

groups and the BAI objected on the grounds that the law was not grounded in current scientific knowledge. These groups argued that non-accredited herds should not add Bang's free cattle to their herds because the animals would end up contracting the disease. Buying reactor cattle made more sense for herds with the disease. The growing variation in state cattle import laws and the questions of scientific authority led the United States Livestock Sanitary Association to suggest that the BAI create Bang's control rules and regulations relating to the interstate shipment of cattle.[85] The USDA traditionally created interstate shipping rules and established quarantines as part of disease control programs. The USLSA thought that BAI regulation would prevent the creation of rules without scientific grounding. However, since no federal eradication program existed and contagious abortion had not been declared an epizootic threat to animal industry, the BAI had no authority to regulate state import rules. Even though these state rules dealt with interstate shipment, an area of law usually under the purview of the federal government and its agencies, the rules originated in the states as part of their control plans, leaving them outside of the USDA's regulatory power.

The demand for BAI regulation of shipping was part of a greater desire for federal involvement in Bang's control. A growing number of veterinary medical practitioners, state animal health officials, and dairy cattle owners wanted a federal control program aimed at eradicating Bang's similar to the federal tuberculosis plan.[86] This plan would include mandatory test-and-slaughter procedures and provide indemnity for destroyed cattle. A 1934 poll of *Hoard's Dairyman* readers found that they approved of this type of plan by a 2:1 margin. Dairy farmers who voted against the plan objected to the mandatory aspect of the program or cited a lack of scientific knowledge to justify a program.[87] While critics of mandatory programs existed and voiced their opinions, enthusiastic believers who thought

[85]"Editorial Comment – New York Ruling," 564.
[86]Committee on Infectious Abortion of the National Research Council, "Meeting Minutes: April 20, 1934," (1934): 71, AR 59-1, Carton 23, Folder 173, no. 2, University of California San Francisco Archives.
[87] "Abortion Control Votes," *Hoard's Dairyman* 79, no. 15 (1934): 353.

that Bang's could be eradicated nationwide outweighed them. In 1934, Virginia became the first state to allow county mandated test-and-slaughter contagious abortion programs.[88] In the following years, other states followed suit by allowing a majority of cattle owners in a county to vote on requiring mandatory programs or mandating testing in areas where the majority of herds already were tested. By requiring a majority, usually at least 75%, of cattle owners to approve of the plan before implementation in the county or already having a majority of herds tested, usually 90%, states guaranteed a high degree of cooperation from cattle owners and placed the burden of the decision for mandatory testing on dairy farmers. Ultimately, industry as represented by cattle owners had the power to mandate state plan participation, not the state itself.

Federal Funding for State Bang's Programs

While states started to allow for mandated Bang's control on their own, federal programs were still desired to help pay for state programs, to standardize programs and policies, and to guarantee eradication across the country. A federal contagious abortion control program did develop during 1934, but not through the BAI. Instead, a federal test-and-slaughter program arose out of New Deal politics. The development of federal Bang's control policy coincided with the start of the Great Depression and the Dust Bowl. Improved dairy production had glutted the market with milk and along with the poor economy, crashed dairy product prices. This price decrease and the Dust Bowl drought made many dairy farms unprofitable. In an attempt to restore the buying power of dairy cattle owners and restore parity to the industry, the United States government amended the Agricultural Adjustment Act (AAA) in 1933 to include cattle as a basic agricultural commodity.[89] The designation of cattle as an agricultural commodity allowed the federal government to purchase cattle for the purpose of

[88] "Editorial Comment – State Control of Bang's Disease," *Hoard's Dairyman* 79, no. 6 (1934): 120.
[89] The act, passed in 1933, tried to balance supply and demand for basic farm crops by paying farmers not produce these commodities.

destruction without an epizootic disease emergency. The Agricultural Adjustment Agency, which oversaw the distribution of funds, encouraged cattle owners to submit unprofitable and diseased animals for destruction. This allowed cattle owners to keep productive animals that still provided income while getting rid of unproductive animals and receiving payment from the government. This policy created a loophole for those wanting a federal contagious abortion control program.[90] Without congressional approval for control of a specific disease, the BAI remained unable to purchase or provide indemnity for cattle slaughtered due to Bang's. The amendment to the AAA provided the opportunity to cull Bang's infected cattle with limited expense to the owners by paying for testing and indemnity without declaring contagious abortion an epizootic cattle disease.

Establishment of federal indemnity created small changes to the economic rhetoric for control. The creation of an indemnity plan indicated that infected cattle would be sold for salvage rather than for full price. The shift in thinking of contagious abortion as a commodities disease that affected and devalued infected cattle led to some change in how veterinary medical officials and dairy farmers thought of the disease. Accepting indemnity meant accepting that contagious abortion was both an economic and health problem.[91] In addition, an increasing number of farmers who had contracted undulant fever and veterinarians began to advocate for Bang's control as a method to prevent occupational illness.[92] The majority of the discourse about contagious abortion control still focused on the economics of eradication, but both animal and human health concerns gained a foothold and began to be integrated into the larger conversation about the new federal control program.

While the AAA program was considered a federal Bang's program, it actually was just a state program with federal funding. In the summer of 1934, the Agricultural Adjustment Agency allotted

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[90]"Statement to be Presented at 15 Regional Meetings Held Between April 1 and April 15, 1934 for Dairy Farmers," (1934): 4, AR 59-1, Carton 32, Folder 173, no. 1, University of California San Francisco Archives.
[91]"Editorial Comment – Bang's Disease Indemnity," *Hoard's Dairyman* 79, no.9 (1934): 204.
[92]Walter Anderson, "Undulant Fever," *Hoard's Dairyman* 82, no. 10 (1937): 312.
Fitch, *Hoard's Dairyman* 82, no. 1 (1937): 23.

three million dollars for Bang's disease control and released that money to the TB Eradication Division of the Bureau of Animal Industry to run the program. Voluntary for states and individual cattle owners, the program acted as a test-and-slaughter plan requiring that all reactors must be disposed of and farms disinfected in order to receive indemnity. The BAI distributed the AAA money to participating states, and state health officials and veterinarians ran the testing, certified the payment of indemnity, and accredited herds.[93] Traditional state-federal animal disease control programs required a great degree of cooperation between state and federal agencies and veterinary medical officials along with acceptance of federal policy at the state level. For Bang's control in the 1930s, the BAI mainly served as a distribution center of AAA funds and not as a partner with states to control the disease across the country. Many states kept their existing plans and just added or changed the test-and-slaughter arm of their programs. States maintained their autonomy and authority to create plans, regulations, and rules or to do nothing at all.

Some states and veterinary health officials embraced federal funding for testing and indemnity.[94] The programs in the dairy states of Wisconsin, Minnesota, Ohio, Virginia, and Washington accounted for 75% of all the cattle tested with federal funds and the Agricultural Adjustment Agency authorized an additional eight and half million dollars in May 1935 to cover more testing and payments.[95] After one year of testing cattle, the BAI released its first national Bang's prevalence estimates. Of cattle tested during the first year of the program, about 11.5% tested positive for *Brucella*.[96] The number of reactors sent to slaughter varied by herds. Some dairy farmers lost a majority of their cows and others only one or two.

Not all states, veterinary health professionals, and dairy farmers endorsed test-and-slaughter

[93]"Federal – State Bang's Disease Testing," *Hoard's Dairyman* 79, no. 14 (1934): 342.
[94]Committee on Infectious Abortion, 71.
[95] "New Funds for Bang's," *Hoard's Dairyman* 80, no, 9 (1935): 238.
[96] United States Congress Senate Committee on Government Operations, 108.

federal funding as a means of Bang's control. In 1936, the Vermont state commission declared Bang's disease the number one enemy of its farmers and dairymen. With tuberculosis disposed of in the state, the state commission focused on the John Dillinger of diseases, contagious abortion that

> in true gangster fashion . . . made its insidious attacks from the ambush and at times when least expected. It has been and still is a treacherous, baffling enemy. Losses, both direct and indirect, accruing from it are appalling.[97]

While animal health officials in Vermont desired the eradication of Bang's, they opposed the use of test-and-slaughter. They argued that the one-size fits all approach of test-and-slaughter did not work due to the nature of the disease. Long incubation periods, differing effects on production, the difficulty of diagnosing cattle with the disease, and differences in the rate of infection in herds necessitated the need for each herd to have its own plan to combat the disease. Plans including quarantine, vaccination, or neighbor buying programs might be more appropriate for a herd than test-and-slaughter.

Other animal health officials complained about the federally funded program as incomplete as a test-and-slaughter program.[98] The federal test-and-slaughter program developed out of an economic program, not a public health program or agency. It established test-and-slaughter as the mechanism for control for reasons of economic benefit and ease, building on the existing tuberculosis eradication program, without consulting or considering other methods and without providing for follow-up for herds. Dissenting animal health workers desired a more flexible federal plan rooted in tested public health principles.

Some dairy farmers also had complaints about test-and-slaughter programs after half a decade

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[97]"Dairy Enemy Number 1," *Hoard's Dairyman* 81, no. 3 (1936): 68.

[98]Committee on Infectious Abortion, 70.
Lintner, 5.
John R. Mohler, A. E. Wight, and H.M. O'Rear, *Calf Vaccination as an Aid in Cooperative Bang's Disease (Bovine Brucellosis) Control* (1940): 1, Cu-20, Box 22:10, University of California Archives at the Bancroft Library.

of participation. Complaints arose from participants who had spent years testing for contagious abortion and still did not have certified herds.[99] These frustrated cattle owners wanted disease free herds but seemed unable to reach this goal with testing and sanitary measures. These farmers sought alternative means of controlling contagious abortion in their herds and often doubted the accuracy of agglutination test. Other dairy cattle owners wanted the government to stop focusing on test-and-slaughter altogether and create control plans based on the strain 19 vaccine.[100] These individuals thought a calfhood vaccination program with gradual herd replacement would be cheaper and more effective than test-and-slaughter. Still other dairy farmers viewed the test-and-slaughter program as killing for the sake of killing and that the indiscriminate destruction of reactors was unnecessary.[101] Since the funding for the control program developed out of an effort to reduce the number of dairy cattle, cattle who tested positive had to be slaughtered. With Bang's disease, reactor cows could still be top milk producers or have healthy calves. Infection by the bacteria often resulted in decreased milk production and abortion, but not always. Some dairy farmers argued that they should have a choice to keep reactors, as they did under the initial Pennsylvania Plan.

Veterinary health officials and dairy farmers who approved of the federally funded test-and-slaughter program responded by defending the accuracy of testing and the long history of test-and-slaughter programs for animal diseases.[102] Researchers also worked to improve and standardize the testing process through better guidelines and regulations. In 1939, the BAI began providing antigens for all agglutination testing allowing for more standardized testing. Supporters of test-and-slaughter programs also referred to American Veterinary Medical Association and United States Livestock Sanitary Association conclusions that strain 19 vaccine remained unproven as a definite method of

[99] "Editorial Comment – Abortion Persists," *Hoard's Dairyman* 81, no. 22 (1936): 583.
[100] "Favors Vaccination for Bang's Disease," *Hoard's Dairyman* 82, no. 1 (1937): 23.
"Another Believer in Vaccination for Bang's Disease," *Hoard's Dairyman* 82, no. 4 (1937): 129.
"B.A.I. Activities During Past Year," *The Cattleman* 19, no. 8 (1933): 6.
[101] W.P. Gwyme, "Bang's Disease," *Hoard's Dairyman* 82, no. 3 (1937): 81.
[102] "Bang's Disease Yields to Systematic Testing," *Hoard's Dairyman* 81, no, 21 (1936): 557.

Bang's control as the rationale to keep the test-and-slaughter program over a vaccine based program.[103] Even with growing debates over the efficiency of the federally funded eradication plan, the program continued to grow and the number of cattle in the program testing positive dropped to 4%. For the fiscal year 1938, the federal government spent approximately $11,425,000 for indemnity and operating expenses and participating states spent about $1,500,000 to test 7,837,365 cattle in 671,308 herds.[104]

The debate over the best method of Bang's control intensified as more evidence on the effectiveness of calfhood vaccination emerged in the late 1930s and range cattle groups started to see vaccination as a possible method of contagious abortion control.[105] Historically, Bang's control bypassed range cattle because veterinary health officials and cattle owners believed they had a low prevalence of the disease, range herds experienced small economic impact loss due to Bang's, and because rounding range cattle up for repeat testing proved difficult.[106] Calf vaccination conducted during a routine roundup provided a more appealing option than test-and-slaughter for range cattle owners, and if range cattle entered Bang's control programs then the possibility of true nationwide eradication was possible. Those states interested in an alternative or supplement to test-and-slaughter began to develop their own vaccination based control programs at the end of the decade. In 1940, the federal government established a vaccination plan separate from its test-and-slaughter program. With worries about diversion of funds if the United States went to war, vaccination programs offered states and the federal government a cheaper control alternative to test-and-slaughter.[107]

Both the federally funded vaccination program and the test-and-slaughter program remained

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[103] W. Wisnicky, "Opposes Vaccination for Bang's Disease," *Hoard's Dairyman* 82, no. 3 (1937): 89.
[104] "Editorial Comment – Bang's Disease Control," *Hoard's Dairyman* 84, no. 18 (1939): 509.
[105] Senate of California, *Special Report of the Joint Legislative Committee on Agriculture and Livestock Problems on Brucellosis in Cattle* (Sacramento: California State Printing Office, 1953), 7.
"Bulletin on Bang's Disease," *The Cattleman* 25, no. 10 (1939): 19.
[106] "Resolutions Passed at Houston, *The Cattleman* 25, no. 11 (1939): 29.
[107] Mohler, Wight, and O'Rear, 1.

voluntary and left the details of herd management to individual cattle owners.[108] The advantage of the federal programs was the shift of cost burden from cattle owners to the federal and state governments. With both programs, veterinary health officials still recommended traditional sanitation methods of quarantine for birthing or aborting heifers and cows and sanitizing anything that came in contact with infected animals.[109] Even with all the knowledge gained over the last forty years about the etiology and epidemiology of Bang's disease and the development of new technologies and techniques to prevent the spread of the disease, sanitation methods from the turn of the century remained an integral part of the suggested control plan for individual cattle owners.

The start of World War II led to the end of both federal control programs. The halt of funding for Bang's disease research at the start of the war and the lack of medical personnel effectively ended government financed research.[110] Cattle owners shifted their focus to producing large quantities of meat and dairy for the war effort, and research focus and funding shifted to wartime disease problems. As a method of increasing production, cattle owners continued to vaccinate their cattle or test-and-slaughter, but they bore the cost since no federal funding existed.[111] World War II quickly pushed both undulant fever and contagious abortion out of the public conscious and even out of the agricultural sectors conscious a little over a decade after it broke through as a major minor public health problem.

Conclusion

[108] A.E. Wight, "Progress in the Bang's Disease Control Program," in *Report of Conference on Bang's Disease of the North Atlantic States, Springfield, Massachusetts, May 26, 27, 1937 : Papers and Discussions* (Springfield, MA: 1939), 4 – 5.

[109] Buck, 10 – 12.

[110] Research on *Brucella* species continued during World War II but as part of the biological warfare program operated by the Chemical Warfare Service at Camp Detrick. Scientists with the weapons program investigated a number of zoonoses as possible biological weapons including anthrax, glanders, psittacosis, and tularemia. The military continued working on weaponized *Brucella* after the war and succeeded in aerosolizing *Br. suis* in 1954.
Barton J. Bernstein, "The birth of the U.S. biological-warfare program," *Scientific American.* 256, no. 6 (1987): 119.
Mark Kortepeter et al, *USAMRIID's Medical Management of Biological Casualties Handbook* (Fort Detrick, Frederick, MD: USAMRIID, 2001), 27.
Conn, 110.
"Brucellosis Number One Livestock Disease," *The Cattleman* 38, no. 5 (1951): 38.

[111] "Franklin Vaccines and Supplies Advertisement," *The Cattleman* 28, no. 11 (1941): 1.

During the 1930s and early 1940s, issues of scientific authority and economics dominated the debate around the impact of *Brucella* infection and its control. During the 1920s, the understanding of the relationship between contagious abortion and undulant fever shifted in the medical community. Physicians, veterinarians, researchers, and public health officials accepted that the Bang's bacillus caused undulant fever in humans. While this theory generated discussion in the medical community for a decade, it did not come to the attention of the public until the publication of an article by Paul de Kruif in a 1929 issue of *Ladies' Home Journal*. This sparked public concern about undulant fever and the safety of the American milk supply.

Many critics of the de Kruif article from the animal and human health communities and the dairy industry questioned the science presented in the piece. Based on his background and by weaving in the story of Alice Evans' discovery, de Kruif gave an air of scientific authority to his article. While most of the public accepted the article as scientifically sound, critics used the increasing number of scientific studies on Bang's bacillus to challenge the assertions made in it. They argued that research indicated that undulant fever was not a problem in the milk supply due to increased pasteurization and that occupational incidences made up the majority of cases. The epidemiology of undulant fever allowed critics to dismiss de Kruif's argument that *Brucella* bacteria posed a major threat to the general population and that all milk must be pasteurized. Those who supported de Kruif's argument wanted increased pasteurization to prevent not only undulant fever, but also other milk-borne diseases and used different interpretations of the same studies to justify their position. Scientific studies drove discussion in the research community about the risk of undulant fever and each group claimed its interpretation of the scientific evidence as correct. Even without the fear of undulant fever, the use of pasteurization spread in the 1920s and 1930s, and public health officials focused on eradication of Bang's in animal reservoirs to completely control undulant fever in humans.

This desire by human health medical officials for eradication of *Brucella* coincided with the

longstanding desire among many veterinarians and cattle owners in the dairy industry community to eradicate contagious abortion. As the major animal agriculture product in the United States, the major source of public concern about undulant fever, and because of the backing of part of the industry, cattle became the target of animal reservoir eradication. Human public health officials and animal health researchers worked together to investigate and control the causal bacteria in humans and cattle, but the rhetoric for control differed between those dealing with the different populations. Human public health officials argued for eradication of contagious abortion in cattle herds in order to prevent the disease in humans. Dairy cattle owners and animal health workers wanted eradication for economic reasons. They utilized studies on undulant fever and its prevalence to justify approaching contagious abortion control as an economic problem rather than a public health problem. Many dairy cattle owners already supported eliminating Bang's for economic reasons before Alice Evans' discovery of the relationship between contagious abortion and undulant fever. The connection between the two diseases just created another economic justification for controlling the bacteria. Consumer demand for disease free milk encouraged dairy cattle farmers to ensure that their herds were free of Bang's. Personal concerns about safety or concerns about human public health folded into the economic rhetoric for control among dairy cattle owners and veterinarians.

With the growing monetary advantages of having a Bang's free herd, many dairy cattle owners started to demand state or federal control programs to regulate disease control efforts as the government did for other animal infectious diseases. In the 1930s, some states developed regulations for interstate cattle shipping or voluntary contagious abortion control plans, but the burden of cost still lay with cattle owners. These dairy farmers faced significant economic loss if they could not eradicate the disease once they enrolled in a state program. Traditionally animal disease control programs involved federal funding and cooperation with the federal government through the USDA and its Bureau of Animal Industry. Contagious abortion was never declared an epizootic disease of national

concern, so the Department of Agriculture lacked the authority to implement a control program or supply funding to relieve the financial responsibility of the cattle owners.

New Deal politics opened a loophole for the federal funding of state Bang's eradication programs. By designating cattle as a commodity under the Agricultural Adjustment Act, the federal government gained the ability to cover the cost of destroyed cattle in test-and-slaughter programs without having to designate Bang's as an epizootic cattle disease. The program deviated from other federally funded animal disease control programs since it was not run through the Bureau of Animal Industry. States needed to follow a few specific test-and-slaughter rules to participate and the only federal government involvement was economic. The new funding for the control program did succeed in shifting the burden of cost for contagious abortion control from participating cattle owners to the federal and state government. The economics of *Brucella* control for dairy cattle owners became more favorable since they could eliminate diseased animals while reducing their herd size, receive indemnity, and create a certificated Bang's free herd that could generate more revenue and allow for easier sale and transport of their cattle.

The development of a disease control program through economic policy rather than through the Bureau of Animal Industry led to criticisms of the program by some animal health professionals and cattle owners. Many of these complaints stemmed from the “unscientific” development of the program. As discussed in the first chapter, the Department of Agriculture developed as the first national scientific institute and the American agricultural community looked to it and its research network for science based solutions for better farming. The implementation of federally funded culling outside of the BAI was unprecedented. Critics of the test-and-slaughter program worried that the program was not based on scientifically tested methods of disease control and questioned if voluntary test-and-slaughter could lead to Bang's eradication. By developing outside the traditional scientific institution for agricultural research, the federally funded test-and-slaughter program came under the suspicion of not being

scientific even though test-and-slaughter was a standard method of animal disease eradication. In addition, the nature of Bang's infection, the difficulty of testing, and the lack of success by some in the program led dissenting animal health officials and dairy cattle owners to question the viability of a test-and-slaughter eradication program.

The development of the strain 19 vaccine by the BAI in the 1930s opened another option of control to cattle owners and drew the attention of range cattle owners who previously had little interest in *Brucella* control efforts. Those cattle owners who avoided test-and-slaughter due to the high cost of testing and culling or the lack of research on it saw vaccination plans as a cheaper, effective, scientifically based alternative for Bang's control. Some states like Vermont and California rejected the rigid federal test-and-slaughter funding program in favor of developing flexible state plans that included vaccination funding. The new technology of a Bang's vaccine allowed for a greater number of contagious abortion control plans and offered an alternative method of eradication for those who disliked the test-and-slaughter program.

In 1940, the federal government began to cover the cost of vaccination, but it never developed an actual Bang's disease control program aimed at federal eradication of the disease. Programs and regulations varied by state, making interstate sale of cattle more difficult and allowing for reintroduction of the disease into contagious abortion free herds. The prevalence of cattle *Brucella* infection declined from 1930 to the start of World War II as it became more economically advantageous and less expensive for cattle owners to develop disease free herds, but no scientific consensus on the best method of eradication arose. The debate in the animal health and cattle owning communities over test-and-slaughter or vaccination based plans and the science and economics of Bang's control dominated discussions of the disease starting in the 1930s and continued on past the end of federally funded programs at the start of World War II.

Chapter 4: Development of a State-Federal Cooperative 1942 – 1955

During World War II, the cattle industry and the federal government focused on increased production to satisfy military demands for meat and milk. Though veterinarians and producers thought of brucellosis eradication as a method to increase production, federal funding of the program ended during the war.[1] The lack of people and extra capital to carry out the federal program negated the gains made through control of the disease.[2] The public, medical officials, and public health workers turned their focus to the injuries and diseases of war, decreasing public and professional interest in controlling animal brucellosis to prevent undulant fever.

While federal funding for testing, indemnity, and vaccinations ended with the start of the war, individual producers kept working on eradication in their herds in order to increase production. State and academic veterinarians continued to advocate for area plans based on test-and-slaughter, vaccination, and segregation, and states continued to accredit herds.[3] The lack of personnel hampered the expansion of the program, but in fiscal year ending in June 1944, 5,235,000 cattle were tested in 386,000 herds across the country with a positive reactor rate of 4.3%, greatly reduced from the 11.5% positive reactor rate when the federal testing program began.[4] Even without federal funding and with limited personnel, state and individual brucellosis control programs made strides into decreasing the rate of the disease.

At the close of World War II, brucellosis again became the focus of the Bureau of Animal

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[1]Federal work with *Brucella* bacteria continued during World War II. *Brucella suis* became the first biological weapon developed by the United States starting and other species of the bacteria along with other zoonotics and epizootics followed. The bacteria was placed in bombs and tested on animal subjects at the end of the war, but was never used in combat. The United States destroyed their stock of weaponized *Brucella* in 1969.
Bret K. Purcell, David L. Hoover, and Arthur M. Friedlander, "Brucellosis," in *Medical Aspects of Biological Warfare*, ed. Zygmunt F. Dembek (Washington, D.C.: Borden Institute, Walter Reed Army Medical Center, 2007), 186.

[2]A.W. Miller, A.E. Wight, and A.B. Crawford, "Developments in Bovine Brucellosis," *The Cattleman* 31, no. 9 (1945): 46.

[3]Miller, Wight, and Crawford.
Elmer Lash, and H.M. O'Rear, "Disease and Parasites of Cattle: Brucellosis," *The Cattleman* 29, no. 8 (1943): 27-32.

[4]Miller, Wight, and Crawford, 46.

Industry and public concern.[5] These concerns led to an increase in brucellosis education and research, and the creation of a federal brucellosis eradication program through the USDA similar to programs used to control pleuropneumonia, tick fever, and tuberculosis. The development of this program revealed tensions between dairy and range cattle interests on how best to control infectious disease and what diseases need the most attention. These two groups utilized veterinary science and professional organizations to lobby for their positions and created a new industry group, the National Brucellosis Committee (NBC), to negotiate their differences, eventually leading to an industry sponsored state-federal cooperative, the Accelerated Brucellosis Eradication Program.

The State of Brucellosis Infection after the War

Even though the infection rate of brucellosis in cattle declined during the 1940s, the disease remained the one holdover disease from the early twentieth century causing economic loss for cattle owners with infected herds. By the mid-century, most infectious diseases of cattle had been eradicated or controlled except for contagious abortion.[6] The Department of Agriculture estimated that in 1947 the United States lost an estimated $100,000,000 in production due to a 5% infection rate across all cattle. This total did not include the cost of the loss of manpower due to occupational illness.[7] Brucellosis accounted for the greater loss of production than any other disease or parasitic infection in the late 1940s despite not affecting a large percentage of cattle.

As the number of cattle cases declined, so did the number of human cases. In 1947, the number

[5]The Department of Agriculture reorganized in 1953 and eliminated the Bureau of Animal Industry. The responsibilities of the department fell to the newly developed Agricultural Research Service (ARS). This became the in-house research arm for the USDA and included animal disease research.
Gladys L. Baker et al., *Century of Service: The First 100 Years of the United States Department of Agriculture* (Washington, D.C.: Centennial Committee, U.S. Dept. of Agriculture, 1963), 376-381.
[6]Susan D. Jones, *Valuing Animals: Veterinarians and Their Patients in Modern America* (Baltimore: Johns Hopkins University Press, 2003), 96.
[7]Karl F. Meyer, *The Zoonoses in Their Relation to Rural Health* (Berkeley, CA: University of California Press, 1955), 9-10.

of human cases of undulant fever peaked at 6124 reported cases.[8] Local pasteurization and milk inspection laws helped prevent incidences of the disease and the introduction of antibiotics provided the first hope of an effective cure for undulant fever.[9] Reduction of infection in the herd along with pasteurization greatly decreased the number of consumer cases of undulant fever. Within a decade, the incidence of undulant fever had dropped to one seventh of its peak and was almost exclusively an occupational illness. Farm workers, packinghouse workers, veterinarians, and laboratory technicians began to represent most of the cases in mid-century America.[10] The handful of yearly consumer cases of brucellosis traced back to goat dairy products or unpasteurized dairy products eaten abroad.

While the number of human cases dropped, public health officials and researchers continued to push for eradication of brucellosis in cattle. In the years since Alice Evans connected contagious abortion and undulant fever, studies of the human diseases revealed that brucellosis could be more serious than waves of fever and fatigue for a few weeks or months. Case studies indicated chronic cases were more common than acute cases and that the disease attacked the nervous system, joints, and the liver.[11] Reporting also showed rarer complications included damage to the heart valves or natal complications for pregnant women, though no association to abortion was reported as in cattle and

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[8]Malcolm H. Soule "A Summary of the Present Knowledge of Brucellosis," in *Brucellosis: A Symposium Under the Joint Auspices of National Institutes of Health of the Public Health Service, Federal Security Agency, United States Department of Agriculture, National Research Council. September 22-23, 1949, Bethesda, Maryland* 247 (Washington, D.C.: American Association for the Advancement of Science, 1950).

[9]Initial testing with antibiotics proved disappointing, since no single antibiotic seemed effective against the disease. The use of combination antibiotic therapies provided the first effective therapies for brucellosis in humans. Currently brucellosis is usually treated with a doxycycline and rifampin in combination for 6 to 8 weeks.
Ibid., 247-255.
Centers for Disease Control and Prevention, "Treatment – Brucellosis," Centers for Disease Control and Prevention http://www.cdc.gov/brucellosis/treatment/index.html (accessed July 20, 2013).

[10]Carl F. Jordan, "The Epidemiology of Brucellosis," in *Brucellosis: A Symposium Under the Joint Auspices of National Institutes of Health of the Public Health Service, Federal Security Agency, United States Department of Agriculture, National Research Council. September 22-23, 1949, Bethesda, Maryland* 99-115 (Washington, D.C.: American Association for the Advancement of Science, 1950).
Wesley W. Spink, "Public Health Aspects of Brucellosis," in *Northeastern States Brucellosis Conference* 31 (New York, 1949).

[11] Wesley W. Spink, "Therapy of Brucellosis in Man," in *Brucellosis: A Symposium Under the Joint Auspices of National Institutes of Health of the Public Health Service, Federal Security Agency, United States Department of Agriculture, National Research Council. September 22-23, 1949, Bethesda, Maryland* 130-140 (Washington, D.C.: American Association for the Advancement of Science, 1950).

swine with the disease.[12] Research on brucellosis also shed light on how the type of *Brucella* infection impacted the course of the disease in humans. Human cases caused by *Brucella melitensis* were more severe and *Brucella suis* was more infectious, but the majority of American cases resulted from exposure to *Brucella abortus* in the early 1940s.[13] As the dominate livestock and dairy producing animal in the US, cattle represented the most likely source of exposure for consumers, farm workers, and veterinary medicine workers.[14] This kept focus on the cattle industry to eradicate the disease in their herds on a national level while interest and research in swine, goats, and sheep species of the disease remained a more localized issue in states with larger concentrations of those animals.[15]

At the same time public health advocates called for eliminating brucellosis in cattle, they used the continued rate of bovine infection to justify pasteurization. While undulant fever transformed from a consumer disease to an occupational disease in the 1940s and 1950s, the threat of consumer disease remained a justification for pasteurization.[16] Most states had laws requiring all milk to come from disease free cows or be pasteurized if the cows tested as reactors for brucellosis. Medical officials still recognized animals as the natural reservoir for *Brucella* and a potential consumer threat and occupational health risk.

Research and Education: Public Health and Economic Rhetoric

In the 1940s, veterinarians and veterinary medicine researchers began systematically including

[12]Ibid., 139-140.
[13]Ibid., 136.
[14]United States Census Office, *U.S. Census of Agriculture: 1959. Volume 2 Statistics by Subjects* (Washington, D.C.: United States Government Printing Office, 1960), 475-482.
[15]T.M. Wells to Frederick J. Lawlon, May 7, 1951, RG16, Records of the Office of the Secretary of Agriculture, General Correspondence 1906-197, Box 1947-1951, Legislation 1-1(22), United States National Archives.
Council of State Governments, United States Department of Agriculture, and United Livestock Sanitary Association, *Brucellosis Control and Eradication Act*, 2, National Agricultural Library.
[16]H.S. Ingraham, "Brucellosis is a Public Health Factor in Northeastern States," in *Northeastern States Brucellosis Conference* 38 (New York, 1949).
Harold Jerome Harris, *Brucellosis (Undulant Fever) Clinical and Subclinical* (New York: Hoeber, 1950), 38.

information about undulant fever and the impact of brucellosis disease eradication on human public health in educational material for cattle owners. During the interwar years, veterinary medical officials had questioned the role of contagious abortion in undulant fever and economic arguments dominated the discourse on eradication in cattle for veterinarians and dairy cattle owners. With research revealing that *Brucella abortus* accounted for the majority of American undulant fever cases and as concerns about occupational infection grew, veterinarians began to focus more rhetoric for control on public health. This was in keeping with a larger shift in veterinary medicine that occurred in the interwar period. As veterinarians attempted to reestablish their professional authority at the end of the horse-powered era, they took on the mantle of public health. Professionals in animal medicine positioned themselves as mediators between animal and human health and claimed that their treatment of animal disease had a direct impact on human health.[17] The control of zoonotic diseases such as tuberculosis and glanders demonstrated how animal disease control impacted human health and created a role for veterinarians that straddled animal and human health.[18] With the eradication of bovine tuberculosis in 1940, brucellosis turned into the animal disease with the greatest impact on human health.[19] Veterinarians began to include more public health rhetoric in educational material for cattle owners as part of their perceived role as protectors of both animal and human health.

Though veterinarians began to emphasis the importance of brucellosis control in cattle to control undulant fever in humans, they still highlighted the economic advantages of eliminating the disease in a herd. Often these two messages went hand in hand as dual reasons for brucellosis eradication in agricultural literature and placed responsibility on cattle owners for both the health of

[17]Jones, 16.
W. G. Brock, "What Veterinary Medicine Means to Texas," *The Cattleman* 26, no. 10 (1940): 139.
[18]Jones, 82.
[19]Spink, "Therapy of Brucellosis in Man," 144-146.

animals and people.[20] Veterinarians

> wish to re-emphasize that the prevention, control, and eradication of Bang's disease are necessary to the most economical production of both beef and dairy cattle, and are responsibilities that cattlemen and dairymen owe to themselves, their families, their employees, and the public.[21]

Since veterinary medicine officials adopted a public health role, they incorporated public health rhetoric into their arguments for brucellosis disease control. Human public health arguments, which focused on the health of both those who worked with cattle and consumers, gained equal footing as animal public health arguments, which focused on economics.

Human public health officials and veterinary medicine officials worked together to share research on brucellosis through national and regional conferences. An example of this cooperation, a joint symposium by the USPHS, USDA, and National Research Council in 1949, had participants from federal and state agencies along with veterinarians and physicians working on brucellosis at universities across the county.[22] Researchers from the NIH, Public Health Service, Department of Agriculture and state agencies worked with academic physicians and veterinarians to share information on the epidemiology of brucellosis in humans and animals and the relationship between the two populations. The relationship with human public health officials strengthened veterinarians' claim to play a role in human health even though they focused on the animal population. The symposium also illustrated the acceptance of the relationship between the human and animal diseases in the medical community and the federal government.

The information and research on the epidemiology of brucellosis shared at public health

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[20]Lash, and O'Rear, 27-28.
"Livestock Diseases Farmer's Largest Debt Item," *The Cattleman* 38, no. 5 (1951): 54.
[21]R.P. Marsteller, "Discussion of Bang's Disease," *The Cattleman* 27, no 12 (1941): 44.
[22]*Brucellosis: A Symposium Under the Joint Auspices of National Institutes of Health of the Public Health Service, Federal Security Agency, United States Department of Agriculture, National Research Council. September 22-23, 1949, Bethesda, Maryland* (Washington, D.C.: American Association for the Advancement of Science, 1950).

conferences and committees was distributed to the agricultural community through industry press, films, displays, speeches, radio programs, pamphlets and bulletins distributed by the USDA, agriculture research station, state agricultural agencies, private veterinary medicine organizations, and industry organizations.[23] These articles, films, and pamphlets focused on dispelling persisting myths or outdated ideas about the epidemiology of the disease, treatment, and prevention.[24] As discussed in the previous chapter, at the start of the 1930s, medical officials and veterinarians questioned the role of cattle in spreading undulant fever and the current level of knowledge about the disease in the United States. The medical, popular, and agricultural press reported on the debate in the professional field so the ideas spread in the cattle owning community. As new research conducted during the following two decades shed light on the epidemiology of the disease, organizations and researchers used both publicly and privately owned media to disseminate new ideas to the agricultural community and highlight the advantages of bovine brucellosis control. Veterinarians and animal medical researchers used the same channels of communication as they did to distribute information about the cause of contagious abortion and its treatment and prevention in the late nineteenth and early twentieth centuries. The information shared with cattle producers included both the economic benefits and the health benefits of eradication of the disease in a herd.

The Case for a Federal Eradication Program

Educational materials from veterinary medical officials served not only to share new research

[23]As discussed in the first two chapters, spreading scientific agricultural information was one of the main reasons for the creation of the USDA. During the early twentieth century government publications shared research and information on contagious abortion, Bang's bacillus, and prevention measures between researchers and cattle owners.

[24]Miller, Wight, and Crawford, 23, 46-54.
C.G. Bradt, "Pulling Together for Healthy Herds," *Hoard's Dairyman* 93, no. 21 (1948): 802, 814.
The Triple Threat of Brucellosis, prod. United States Department of Agriculture Office of Public Affairs, 1951, film reel.
W.H. Conway to H.P. Rusk, May 26, 1948, RG33, Box 78, Entry NC-117, 3A, United States National Archives.
Livestock Conservation Program, *Get Rid of Bang's Disease: Brucellosis in Cattle* (Chicago, 1948).
R. W. Smith et al., *What is Known About Brucellosis* (Richmond, VA: The United States Livestock Sanitary Association, 1949).

and animal public health measures, but also as health advocacy literature calling for cattle owners to accept brucellosis control and care by a trained veterinarian.[25] The general acceptance of the disease as a human and animal issue that caused the greatest amount of damage to animal products led many health workers and cattle owners to demand that the USDA create an eradication program. Significant progress towards control had been made before the start of the war and even when federal support ended, states continued their accreditation programs. The cattle owners and livestock officials (mostly in dairy states) calling for a federal eradication program after World War II sought to finally end the disease in the United States.[26] These owners desired eradication rather than control to end the threat of reinfection by neighbor cattle or a newly purchased animal.[27] They also hoped to create a more unified program to simplify the process of shipping and selling cattle interstate.

Each state with brucellosis control legislation had different rules and restrictions to control brucellosis and usually focused on dairy and breeding cattle. Some states had control programs while other just required testing and disclosure to sell dairy and breeding cattle, and almost all states had some accreditation program.[28] North Carolina became the first modified certified brucellosis state in 1941 through mandatory test-and-slaughter while California supported a vaccination program at the time.[29] Some states required brucellosis vaccination or made it semi-compulsory for dairy or breeding

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[25]This was a continuation of a trend established during the initial discovery of the Bang's bacillus. As discussed in the second chapter, veterinarians urged cattle owners to contact and hire veterinarians starting in the 1890s as they tried to establish a professional reputation as animal healers.
Marsteller, 44.
John B. Herrick, "A Veterinarian Looks at Brucellosis," *Hoard's Dairyman* 95, no. 10 (1950): 406.

[26]"Editorial Comment – Those Health Regulations," *Hoard's Dairyman* 97, no. 16 (1952): 690.
National Brucellosis Committee, *Proceedings Formation Meeting of the National Brucellosis Committee* (Chicago, 1949), 5.

[27]G.M. Worrilow to the Director of Extension Service, RG 33, Box 110, Entry NC-117, 3A, Meet-Conf. July 1 to March 31 1949,United States National Archives.
National Brucellosis Committee, 24.

[28]Lash, and O'Rear.
G.M. Worrilow to the Director of Extension Service.

[29]"Editorial Comment – Bang's Free State," *Hoard's Dairyman* 87, no. 15 (1942): 412.
Senate of California, *Special Report of the Joint Legislative Committee on Agriculture and Livestock Problems on Brucellosis in Cattle* (Sacramento: California State Printing Office, 1953), 8-11.

cattle in order to receive indemnity or accreditation. As during the interwar period, each state had its own rules for interstate transportation and for herd replacement requirements in the mid-1940s.[30] All of the different regulations and requirements for accreditation frustrated dairy cattle owners participating in interstate sales.

State programs and the test-and-slaughter program of the 1930s also often frustrated cattle owners and veterinarians since they did not allow for flexibility for individual herd planning. The original brucellosis state program, the Pennsylvania plan, and the federally funded test-and-slaughter plan originated with the state-federal tuberculosis eradication program and utilized the same animal public health techniques that led to the control of epizootics, like tuberculosis. Test-and-slaughter, quarantine, and accreditation proved effect for these diseases, but not for contagious abortion.[31] Agglutination testing titers and antibodies had been standardized, but the long incubation period, the possibility of false negatives and suspicious reactors, and a vaccine that did not confer full herd immunity, meant tested infected cattle escaped slaughter and went on to infect accredited and vaccinated herds. Without eradication, accredited herds remained vulnerable to reinfection.

Development Towards Flexible Plans

The development of the strain 19 vaccine provided states with new options for control and allowed for more control program options, but vaccination remained a supplement to test-and-slaughter. In 1944, the BAI officially approved three control methods that represented an evolution of the original

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J. Traum, "The Control of Brucellosis in Animals By the Use of Vaccine," in *Brucellosis: A Symposium Under the Joint Auspices of National Institutes of Health of the Public Health Service, Federal Security Agency, United States Department of Agriculture, National Research Council. September 22-23, 1949, Bethesda, Maryland* 232 (Washington, D.C.: American Association for the Advancement of Science, 1950).

[30]"Editorial Comment – Those Health Regulations".
Worrilow to the Director of the Extension Service.

[31]Herbert L. Gilman, "The Control of Brucellosis in Animals Employing Test and Slaughter Methods," in *Brucellosis: A Symposium Under the Joint Auspices of National Institutes of Health of the Public Health Service, Federal Security Agency, United States Department of Agriculture, National Research Council. September 22-23, 1949, Bethesda, Maryland* 236 (Washington, D.C.: American Association for the Advancement of Science, 1950).

test-and-slaughter method due to the approval of the stain 19 vaccine. Test-and-slaughter, test-and-slaughter with calfhood vaccination, and test-and-retention with calfhood vaccination with no indemnity plans met with bureau approval though the BAI refused to create a federal control program based on any or all of the control programs. Despite criticisms from some veterinarians and cattle owners, the BAI thought that no one plan had been demonstrated as an effective brucellosis control measure. They wanted to continue testing new methods of control and suggested these plans for states or owners to implement in order to prevent brucellosis infection rates from increasing.[32] The choice in plans allowed states and individual owners to adopt the plan that worked best for their area or herd. Brucellosis rates varied greatly across the country based on geography, cattle use, and farm conditions so the three different plans allowed cattle owners to pick the most appropriate one for their herd.[33] A vaccination only plan, which many range cattle owners, some dairy cattle owners, and some veterinarians desired was not one of the approved programs.[34] The test-and-retention program allowed herd owners to keep reactor cattle and replace them with vaccinated calves as they mature, but the cattle owners and veterinarians who wanted only vaccination thought any blood testing unnecessary, expensive, and inaccurate. The expansion of plan options from the BAI provided for flexibility but not the full range of options that vaccine only supporters desired.

States began to adopt brucellosis programs with multiple plan options to try to increase involvement in control programs and to address industry complaints about the existing programs. In 1945, Illinois began a state control program aimed at individual herd control options within the same program.[35] The state's Committee on Livestock Legislation solicited the opinion of cattle owners and

[32]Miller, Wight, and Crawford 23, 46-47.
[33]"Thoughts on Bang's Disease Control," *The Cattleman* 29, no. 10 (1943): 8-11.
"Editorial Comment – Let's Use the Milk Ring Test," *Hoard's Dairyman* 96, no. 23 (1951): 954.
[34]Senate of California, 8-11.
Thoughts on Bang's Disease Control 8.
"Editorial Comment – Vaccinating Cattle," *Hoard's Dairyman* 87, no. 5 (1942): 144.
[35]Illinois Department of Agriculture, Division of Livestock Industry, *Facts regarding Bang's disease, or bovine brucellosis*

veterinarians across the state to determine how to improve their program and develop plans which would have the support of the participants. Those who worked with cattle complained that the existing state program, established initially as a test-and-slaughter program, mandated testing for a whole herd including calves before allowing cattle to be vaccinated. This costly and time consuming process hampered brucellosis control efforts in the state and caused some cattle owners to resist joining the state control effort.[36] In response, the state Department of Agriculture developed a voluntary bovine brucellosis program that allowed herd owners to choose their plan. The program recognized that while all herds under brucellosis control programs shared certain sanitation measures, each herd had a different rate of infection that impacted the most desirable control plan. The plan recommended that states require testing and isolation of reactors for accredited herds or moderately infected herds and provided for indemnity. The plan for heavily infected herds required calf vaccination and testing of older cattle and allowed herds to keep reactors but provided no indemnity.[37] These two different plans kept programs the same for already accredited herds and allowed owners who would have suffered significant losses under the previous plan to retain productive animals while raising vaccinated replacement cattle. By listening to the needs of cattle owners and their veterinarians who wanted to develop their own herd control plans, the state created a program designed to gather the greatest amount of participation.

Illinois adopted the BAI plan for its own individual use and allowed for individual choice of plans. This was the bureau's goal when it announced the decision to endorse a multiplan program, but not a designated federal brucellosis control program. It wanted states to continue to develop brucellosis control programs that had industry support (and therefore wide acceptance) in their area. Other states adopted programs better suited to their state and cattle owners. In California, the state decided to start a

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control, with application for herd test: a plan of control for every herd (1945).
[36]Ibid., 1-2.
[37]Ibid., 3-4.

vaccination only program after successfully testing the vaccine as a control method for 15 years.[38] The program paid for the vaccinations of all female calves and required it for dairy cattle starting in 1945. This program differed greatly from the Illinois brucellosis program, but the BAI tried not to interfere in either program or to standardize the state programs. The bureau allowed states to run the brucellosis control program as states saw fit.

The United States Livestock Association Plan

In the mid-1940s, the concept of flexible herd plans under one federal brucellosis control program appealed to veterinary medical officials and cattle owners across the country who wanted to eradicate brucellosis. A flexible program allowed herd owners to choose the best method of control based on the rate of infection in their cattle and cost. Also, since both testing and calf vaccination had their downsides, cattle owners could pick the program they believed worked best for their herd. A unified federal program with different plans created uniform interstate shipping and accreditation laws allowing for easier interstate commerce.[39] Most veterinarians in dairy states and dairy cattle owners favored a federal plan since the dairy industry had seen a major decrease in the prevalence of brucellosis and an increase in calf production of about 25% and about a 20% increase in milk production in brucellosis-free herds.[40]

In December 1947, the United States Livestock Sanitary Association proposed a state-federal brucellosis eradication program.[41] This program included four different plans, test-and-slaughter, test

[38]Senate of California, 8-9.
[39]Ibid., 7.
Worrilow to the Director of the Extension Service.
[40]Lash and O'Rear, 31.
"Brucellosis Number One Livestock Disease," *The Cattleman* 38, no. 5 (1951): 38.
[41]As explained in the first chapter, the United States Livestock Sanitary Association started in the 1890s as a professional organization for those involved in animal disease control. The organization also invited industry officials to participate in all their meetings and usually representatives from the USDA also attended. The USLSA lobbied the USDA for more funding, research, and policy for animal disease control. This private organization acted as a quasi-government industry

and calfhood vaccination, calfhood vaccination without testing, and adult vaccination with state and federal approval. It also called for identifying reactors and vaccinated cattle through branding, ear tags, or tattoos and federal funding for testing in participating areas. The USLSA also encouraged the BAI to provide education about any bovine plan, information on swine brucellosis, and require tighter control of the strain 19 vaccine.[42] Instead of solving the debate over test-and-slaughter or calfhood vaccination as a control mechanism, it incorporated both and allowed herd owners to choose the plan they preferred. It also provided for clear identification that expedited cattle sales and the culling process.

The USLSA proposal included a recommendation for adult vaccination, a controversial issue among veterinarians and cattle owners. Initially the USDA only approved the vaccine for calves, but the concept of adult vaccination gained popularity. In California, state veterinarians approved of revaccination for older cattle to boost immunity and to prevent breaks in immunity in the herd.[43] However, adult vaccination posed a problem for the testing program. The strain 19 vaccine conferred immunity against Bang's by infecting an animal with a mild strain of *Brucella abortus*. As a result, most inoculated cattle had a raised titer level when blood tested for several months to years after being vaccinated.[44] Raised titers marked the animal as suspicious or reactor, making it ineligible to be sold as dairy or breeding cattle in many states, and for dairy cows making its milk illegal for sale without pasteurization in many states. Research on the vaccine showed that most calves returned to negative titer results within a few months while adults reacted to the blood test for years.[45] Since all states with

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cooperative and the Bureau of Animal Industry often accepted its suggestions as policy.
Neal F. Black, *Animal Health: A Century of Progress* (Richmond, VA: United States Animal Health Association, 1996), http://portals5.gomembers.com/Portals/6/AnimalHealth-ACenturyOfProgress.pdf (accessed March 12, 2013), 1-7.
"Bang's Program Approved," *Hoard's Dairyman* 93, no. 22 (1948): 860.

[42]F. E. Mollin to the American National Live Stock Association Executive Committee, October 4, 1947, Texas and Southwestern Cattle Raisers Association Records, Box 2P296, Folder – American National Livestock Association Correspondence and Reports, Dolph Briscoe Center for American History, University of Texas at Austin.
"Brucellosis Eradication," *The Cattleman* 34, no. 8 (1948): 123.

[43]Traum, 230.

[44]George H. Conn, "When Vaccinating Adult Cattle," *The Cattleman* 30, no. 2 (1943): 28-29, 43.

[45]George H. Conn, "The Bang's Disease Control Program," *The Cattleman* 28, no. 2 (1941): 41.
Report of the Chief of the Bureau of Animal Industry Agricultural Research Administration (Washington, D.C.: United

testing requirements for sale or for disease control relied on agglutination tests, vaccination turned an animal into a reactor and therefore an infected animal in the eyes of the state. As a result, states denied indemnity for adult vaccinated herds and the BAI only recommended vaccinating negative testing mature cattle in highly infected herds as a method to quiet "abortion storms".[46] The decision to vaccinate negative adult cattle fell to herd owners and their veterinarians who weighed the option of continued spread of Bang's in their herd or the possibility of having unsellable cattle. Calfhood vaccination remained the recommended and preferred method of vaccination, but not the only option for cattle owners.

The recommendation for a national brucellosis program coming from the USLSA indicated to the BAI that there was increasing state and industry support for a federal control program. The group composed of state animal health officials and cattle industry leaders represented the shift in perception that brucellosis presented a significant economic and health problem in the United States. The BAI, charged with protecting the nation's agricultural economy from disease threats, knew that it could not carry out a Bang's eradication program without industry support. Historically, cattle owners resisted and actively fought against programs if they thought they infringed on their rights to run their business. The BAI had the right to force compliance with a program if a disease presented an immediate, epizootic threat to the livestock economy of the United States, but for the control of enzootic commodities disease like brucellosis, industry support of a program became vital to the success of the program.[47] If the Bureau forced a program on the cattle industry without support, industry groups

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States Government Printing Office, 1948), 99.

[46] Illinois Department of Agriculture, Division of Livestock Industry, 1-2.
George H. Conn, "Adult Vaccination for Bang's Disease," *The Cattleman* 31, no. 3 (1944): 19.

[47] Highly contagious diseases epizootic diseases which led to death of the infected animal such as contagious bovine pleuropneumonia and foot-and-mouth disease led to creation of different types of control and eradication programs than persistent enzootic diseases that impacted like tick fever and tuberculosis. As producers accepted that brucellosis was a disease that needed to be controlled, it fell into the latter category. Enzootic eradication programs needed the cooperation of all parties involved in order to succeed.
Karl F. Meyer, "Endemic Brucellosis: A Plan for Eradication," 19, BANC/MS 76/42, Carton 48, Folder – Bills in

would lobby against the program resulting in no control effort at all. Research, educational outreach, and the successful personal experiences of individual herd eradication turned many cattle owners into brucellosis control believers in the 1940s. The USLSA plan proposal indicated that enough industry and state support had been garnered to start federal funding of state programs again.

Federal Funding of State Brucellosis Control

By the end of 1948, 41 states adopted all or parts of the USLSA plan and the BAI supported these efforts financially and legislatively. The Department of Agriculture appropriated $5,000,000 to pay for testing, vaccination, and veterinarians for 1949 and 1950 and states also supplied funds for more testing and vaccinations.[48] The Bureau still thought that none of the eradication plans had significant scientific proof of effectiveness, so it continued resisting implementation of a federal brucellosis program. States still chose their preferred method of control and made their own rules for interstate testing and shipment since the federal government just supplied funding. As earlier in the decade, some states decided to have vaccination only programs, some stayed test-and-slaughter based, and others fully adopted the USLSA plan.[49] The dissatisfaction among cattle owners who participated in interstate commerce remained since all the states still had different rules and regulations for control and interstate shipping.[50] Navigating the maze of different brucellosis control regulations in different states frustrated dairy cattle producers and led them to continue to call for a uniform federal brucellosis

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Legislation, The Bancroft Library, University of California Berkeley.
B.T. Simms, "Federal Aspects of the Control of Brucellosis," in *Brucellosis: A Symposium Under the Joint Auspices of National Institutes of Health of the Public Health Service, Federal Security Agency, United States Department of Agriculture, National Research Council. September 22-23, 1949, Bethesda, Maryland* 243, 246 (Washington, D.C.: American Association for the Advancement of Science, 1950).
Charles A. Sheffield to P.O. Davis, March 1, 1949, RG33, Box 110, Entry NC-111, 3A, Meet-Conf. Brucellosis, United States National Archives.

[48]"Should the State Pay for All Bang's Control Services?," *Hoard's Dairyman* 93, no. 23 (1948): 898.

[49]"Pennsylvania Adopts New Bang's Disease Program," *The Cattleman* 36, no. 8 (1950): 48.
Senate of California, 7-9.
Grade "A" Milk Investigation Commission, *Report of the Grade "A" Milk Investigation Commission: Submitted Pursuant to the Provisions of an Act of the 68th General Assembly Approved July 2, 1953* (Springfield, IL: 1953), 7-8.

[50]"Editorial Comment – Hope for Uniform Regulations," *Hoard's Dairyman* 98, no. 13 (1953): 592.

eradication program with federally controlled interstate shipping rules. States adopting brucellosis control programs based on the Livestock Sanitary Association suggestions helped to continue brucellosis eradication efforts, but it did not standardize the programs.

At the same time, the BAI tried to create uniform national interstate cattle shipment laws dealing with brucellosis in order to expedite the sale of cattle across state lines while controlling the spread of the disease. In order to make interstate law, the Bureau had to amend the Animal Industry Act to include brucellosis control. The Animal Industry Act, which granted the USDA the authority to control infectious diseases in livestock, banned the interstate movement of cattle or other livestock with a communicable disease.[51] Under the existing law, some cattle owners faced potential large losses that could cause the program to stall, so the Department decided to ask Congress to amend the act to allow for reactors to be moved interstate for slaughter. Similar amendments to the act previously passed to allow for the movement of cattle with tick fever and tuberculosis.[52] The first time the amendment was proposed in 1949, representatives of the livestock industry lobbied against its passage because they thought it did not make exceptions for vaccinated cattle reactors. These industry members recognized the need to control the movement of reactors interstate for slaughter, but wanted additional rules for vaccinated calves who might test as reactors.[53] The USDA rewrote the amendment to account for the concerns of the industry and the amendment passed in October 1951.[54] States could create additional shipping laws, but the federal law created a baseline standard that all states had to follow. The

[51]The Animal Industry Act is also known as the Act of May 29, 1884. It established the Bureau of Animal Industry and the right of the Department of Agriculture to regulate animal disease in the United States.
Gladys L. Baker et al., *Century of Service: The First 100 Years of the United States Department of Agriculture* (Washington, D.C.: Centennial Committee, U.S. Dept. of Agriculture, 1963), 23.

[52]*A Bill to Amend the Act of May 29, 1884*, RG16, Records of the Office of the Secretary of Agriculture, General Correspondence 1906-1975, Box 1947-1951, Legislation 1-1(22), United States National Archives.

[53]Charles Brannan to Sam Rayburn, May 28, 1951 RG16, Records of the Office of the Secretary of Agriculture, General Correspondence 1906-197, Box 1947-1951, Legislation 1-1(22), United States National Archives.

[54]The new amendment also gave the department the authority to control and eradicate brucellosis in all domestic animals in order to eliminate all reservoirs of the disease. The USDA expanded its focus for prevention from just cattle to all animals indicating a concern for not just economics, but also human public health as the number of cases contracted through cattle decline.
Ibid.

amendment banned the movement of adult reactor cattle, but did not require cattle to be tested before or after shipment. This created a loophole that allowed animals to be shipped with no restrictions if they had never been tested.[55] If the status of the animal remained unknown, it escaped the purview of federal regulations.

The language and loophole in the Animal Industry Act amendment arose because of the demands of cattle owners. Cattle industry interest groups, including those that lobbied for the dairy and range cattle industries, had a considerable amount of power at the local, state, and federal level. Over the decades, cattle owners developed powerful industry groups to protect their interests at all levels of government.[56] In 1949, cattle and cattle products produced $12.1 billion in revenue, comprising 54.9% of all farm products sold.[57] As a major component of the agricultural industry, cattle owners had the power to direct legislation, policy, and funding. The cattle owners who supported brucellosis eradication continued to ask the BAI to adopt the USLSA program and create uniform interstate shipping laws without loopholes.

The Case Against Federal Brucellosis Control

Not all members of the cattle industry desired a federal brucellosis eradication policy. Some cattle owners thought that since the disease was not an epizootic that threatened the entire livestock industry, the industry should be responsible for disease control rather than the state. They questioned "whether or not we can morally justify asking every taxpayer to dig down for his or her share of this tremendous cost."[58] Other cattle owners worried about losing control of their herds to veterinarians and the state if they entered the program and believed that Bang's control should be based on the experience

[55]"Editorial Comment – Hope for Uniform Regulations."
[56]See Chapter 1 for more information.
[57]United States Bureau of the Census, *United States Census of Agriculture: 1950* (Washington, DC: United States Government Printing Office, 1952), 35.
[58]"Should the State Pay for All Bang's Control Services?."

of cattle owners not the theory of officials.[59] Cattle owners voiced these concerns and fears through industry groups that interacted with each other, veterinary medical groups, government agencies, and legislators.

For the most part, opposition to a state-federal brucellosis eradication cooperative came from the range and semi-range cattle industry. While not all range cattle owners opposed a federal eradication program and not all dairy cattle owners approved of one, the divide often developed based on the usage of cattle and geography.[60] Earlier brucellosis control programs and legislation had focused on the dairy and breeding cattle industry, while range cattle had been excluded from these early attempts at control.[61] In an effort to completely eradicate the disease, the proposed USLSA state-federal cooperative program included range cattle in its rules and regulations. This move drove range cattle owners and range cattle industry groups to resist and reject the program to eradicate brucellosis.

Range cattle industry groups thought that the brucellosis eradication campaign benefited the dairy industry but not the range industry. In the 1940s, many states began requiring testing or vaccination for all dairy cattle.[62] Even in states that did not require any control programs, many individual dairy herd owners paid for testing and vaccination because of the economic benefit of having a disease-free herd. States started banning the sale of milk from reactor cows and sale of dairy reactor cattle. Dairy herd owners or occasionally state animal disease control agencies paid for their own herd eradication programs to comply with these laws. The funding of state programs by the BAI shifted the burden of cost from the owner and state animal disease control agencies to the federal

[59]"Workable Bang's Control," *Hoard's Dairyman* 96 no. 7 (1951): 284.
[60]F. E. Mollin to the American National Live Stock Association Executive Committee, October 20, 1948, Texas and Southwestern Cattle Raisers Association Records, Box 2P296, Folder – National Livestock Association Correspondence and Reports 1948-1949, Dolph Briscoe Center for American History, University of Texas at Austin.
Fred C. Jones to C. U. Pickrell, February 28, 1949, RG33, Box 110, Entry NC-117, 3A, Meet-Conf. Brucellosis July 1 to March 31 1949, Unites States National Archives.
[61]G.M. Worrilow to the Director of Extension Service.
B.A. Beach, "Can This Problem Be Solved," *Hoard's Dairyman* 74, no. 8 (1929): 406.
[62]Grade "A" Milk Investigation Commission, 7.

government though the state still covered some cost of testing. Many range cattle owners saw this as a subsidy from the federal government to cover the cost of removing Bang's from dairy herds and the milk supply.[63] The initial federally funded control program existed as a subsidy program designed to decrease the surplus population of dairy cattle in the United States. Those who opposed the program on these grounds saw the new brucellosis eradication program as a continuation of a preferred subsidy to dairy cattle owners who also stood to gain economically if they complied with the new program.

The argument that a federal brucellosis control program existed to subsidize the dairy industry tied into a larger argument about the freedoms and rights of cattle producers and their business practices. During World War II, the federal government adopted price control and rationing measures for meat, and after the war President Truman tried to keep some of this policy in place.[64] Many range cattle owners saw brucellosis control and the perceived subsidies for the dairy cattle industry as an attempt for the federal government to control or regulate price and demand, and they folded the discussion of the federal control program in with their rhetoric about the cattle industry, capitalism, and free markets and their opposition to the Brannan plan as part of the Fair Deal.[65] Trading on the longstanding perception that farmers and producers were intrinsically linked with the democratic nature of the country, range cattle owners who opposed government run Bang's eradication argued that the

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[63]"Calfhood Vaccination Urged," *The Cattleman* 42, no. 8 (1956): 20.
Resolutions Adopted at the Texas and Southwestern Cattle Raisers Association Meeting of the Board of Directors, Fort Worth, TX, June 26, 1948, Texas and Southwestern Cattle Raisers Association Records, Box 2P298, Folder – Circulars 1947-1948, Dolph Briscoe Center for American History, University of Texas at Austin.
"Resolution No. 6," Texas and Southwestern Cattle Raisers Association Records, Box 2P346, Folder – Texas and Southwestern Cattle Raisers Association Board Meeting at Amarillo (1949), Dolph Briscoe Center for American History, University of Texas at Austin.

[64]John T. Schlebecker, *Cattle Raising on the Plains, 1900-1961* (Lincoln: University of Nebraska Press, 1963), 173 – 186.

[65]Farm policy was a major component of the Fair Deal. This included new farm laws that replaced the wartime modified 1938 Agricultural Adjustment Act and helped transition producers from wartime production to meet the needs of consumers during peacetime. This included flexible pricing that allowed the market to set the price for commodities while the federal government had the option to pay extra to producers for their goods. The Brannan plan challenged the popular flexible support scale by creating a mandatory program to paid farmers a government payment on top of market value to achieve parity. The Brannan plan did not pass for multiple reasons including the rejection of a rigid pricing program by many agricultural groups who thought that controlled markets made sense during wartime, but not peacetime.
Virgil W. Dean, "Charles F. Brannan and the Rise and Fall of Truman's "Fair Deal" for Farmers," *Agricultural History* 69, no. 1 (1995): 28-53.

program interfered not only with their right to conduct business but also with the underlying democratic principles of the country.[66] Brucellosis control became part of the larger legislative and political battle over agriculture and the involvement of the federal government in the agricultural industry.

Most range cattle owners did not perceive Bang's as a significant economic problem in their animals. To these cattle producers, "Bang's Disease is not now and never has been a serious problem in the range production of livestock . . ."[67] Since range cattle were raised for meat and not dairy, their main product remained unaffected by the disease. Range cattle owners who eliminated brucellosis from their herds experienced an increase in calf production, but most owners accepted some loss calves as part of the business.[68] In addition, the logistics of raising range cattle meant that the animals spent little time in close quarters which reduced the risk of contracting *Brucella*.[69] These owners thought of brucellosis as a dairy disease and not a cattle disease.

Instead of focusing on brucellosis, range industry groups wanted the BAI to work on diseases they believed posed the most risk to the cattle industry. In the mid-1940s, foot-and-mouth disease reemerged in Mexico and threatened to spread across the border into the United States. Range cattle owners in border areas worried about the reintroduction of the highly contagious disease and thought that the push for a national brucellosis program took attention and funding away from foot-and-mouth prevention.[70] These cattle owners wanted more USDA funding towards monitoring the border, creating a new trade treaty with Mexico, and the development of a fence to prevent the movement of animals

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[66]Bryant Edwards, Statement to the Sub-committee on Agriculture of the Senate on Secretary Brannan's New Farm Program made July 18, 1949," Texas and Southwestern Cattle Raisers Association Records, Box 2P299, Folder – Circulars 1949-1950, Dolph Briscoe Center for American History, University of Texas at Austin.

[67]*Resolutions Adopted at the Texas and Southwestern Cattle Raisers Association Meeting of the Board of Directors, Fort Worth, TX, June 26, 1948*.

[68]Lash, and O'Rear, 31.

[69]"Resolution No. 6".

[70]C. E. Weymouth to the Texas and Southwestern Cattle Raisers Association Executive Committee, January 7, 1947, Texas and Southwestern Cattle Raisers Association Records, Box 2P298, Folder – Circulars 1945-1946, Dolph Briscoe Center for American History, University of Texas at Austin.

between the countries without inspection.[71] Foot-and-mouth disease presented a greater threat to the economics of their herds than brucellosis so these cattle owners lobbied for funding towards their pressing disease concern instead of brucellosis.

Since most range cattle owners worried more about other diseases and dismissed the importance of eradicating brucellosis in their cattle, range industry groups lobbied against a national compulsory brucellosis program like the USLSA proposal. These cattle owners did not object to brucellosis control in general. They accepted that the animal disease caused undulant fever in humans, that Bang's disease caused loss for the cattle industry, and that eradicating the disease decreased human disease incidences and increased production of calves and milk.[72] Some individual range cattle owners submitted their herds to state programs, and the industry encouraged vaccination of calves, supporting the vaccination only option in the USLSA plan.[73] However, most range cattle owners refused to support any program with testing of all cattle.[74] In most states, testing programs required animals to be individually blood tested every 60 to 90 days in infected herds and every year in accredited herds along with testing immediately before and after sale of an animal.[75] Since range cattle typically grazed over large portions of land, gathering cattle for frequent testing became a significant hurdle for test-and-slaughter based eradication. Vaccination without testing became the most popular control option for range cattle owners

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[71]Just as supporters of brucellosis eradication lobbied the USLSA to request a state-federal program, supporters of foot-and-mouth disease prevention successfully got the organization to support federal legislation for an animal-tight fence between Mexico and the United States in the 1948 meeting. The fence plan did not go anywhere on the federal level. The BAI and the USDA did not ignore the threat of foot-and-mouth disease and created a new animal shipment treaty with Mexico in the early 1950s to prevent the reemergence of the disease in the United States.
C. E. Weymouth to the Texas and Southwestern Cattle Raisers Association Executive Committee "Bang's Program Approved," 860.

[72]F. E. Mollin to the American National Live Stock Association Executive Committee, October 4, 1947. "Brucellosis Number One Livestock Disease".

[73]Schlebecker, 181.
Byron M. White, "Takes Issue with Bang's Statement," *The Cattleman* 29, no. 10 (1943): 68.
F. E. Mollin to the American National Live Stock Association Executive Committee, October 4, 1947.

[74]F. E. Mollin to the American National Live Stock Association Executive Committee, October 4, 1947.

[75]Lash, and O'Rear, 30.
John R. Mohler, A. E. Wight, and Elmer Lash, *Benefits of Eradicating Bang's Disease, Misc Publication No 384* (Washington, D.C.: United States Government Printing Press, 1940), 16.

and the only one endorsed by most range industry groups.

Since range industry groups only supported vaccinations for range cattle, they thought that the country could only achieve brucellosis control and not eradication. These cattle owners argued that no scientific consensus on a method of national eradication had been reached and that no evidence existed that brucellosis could ever be eradicated.[76] They objected to developing a plan not based on scientific information.[77] The BAI's resistance to developing a federal control program and debate among veterinarians over test-and-slaughter or vaccination fueled this argument. Veterinarians who supported the concept of control and vaccination only programs endorsed range cattle producers' points of view.[78] Producers and vaccination supporting veterinarians demanded more research on control measures and better vaccines before the federal government created any brucellosis control program.

Many veterinarians and livestock groups utilized educational materials on the most recent brucellosis research to gain support for brucellosis control in the early and mid-1940s. Groups and individuals opposed to federal control also wanted more educational information and dissemination of recent research. Just as veterinarians who supported a federal eradication program used media to raise support for eradication, veterinarians who opposed a compulsory federal program published pamphlets, wrote articles for industry press publications, made speeches, and generated research. With the decline of cattle brucellosis and the decrease in bovine caused cases of undulant fever, they thought that presenting these new statistics would stop animal public health officials from passing strict regulations on cattle movements and shift attempts to prevent occupational related undulant fever incidences to

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[76]*Resolutions Adopted at the Texas and Southwestern Cattle Raisers Association Meeting of the Board of Directors, Fort Worth, TX, June 26, 1948*.
C. E. Weymouth to Will J. Miller, October 27, 1947, Texas and Southwestern Cattle Raisers Association Records, Box 2P346, Folder – Bang's Disease 1947-1949, Dolph Briscoe Center for American History, University of Texas at Austin.
Joe G. Montague to Bryant Edward, October 24, 1948, Texas and Southwestern Cattle Raisers Association Records, Box 2P346, Folder – Bang's Disease 1947-1949, Dolph Briscoe Center for American History, University of Texas at Austin.
[77]"Resolutions Adopted at 73rd Annual Convention," *The Cattleman* 36, no. 11 (1950): 29.
[78]White, 68.
"Discuss Vaccination to Control Brucellosis," *The Cattleman* 33, no. 6 (1946): 118.
John B. Herrick, "A Veterinarian Looks at Brucellosis," *Hoard's Dairyman* 95, no. 10 (1950): 406.

swine producers.[79] These decreases indicated that the state and industry control efforts effectively ended the public health and economic threat of brucellosis so starting a federal eradication program was an unnecessary expense.

Cattle owners who opposed a federal eradication program also argued that the adoption of a national program created unneeded restrictions that hampered the free movement of range cattle. Since restrictions on interstate cattle movement often targeted dairy cattle, the proposed uniform rules for interstate trade created new restrictions on range cattle owners.[80] For dairy cattle owners, a federal interstate shipping law would lead to clarity and expedite the shipment of cattle while range cattle owners thought it would burden them and slow the shipment of cattle. The concern about restrictions on interstate movement of range cattle led the range and semi-range cattle industry to successfully lobby for the loophole in the amendment to the Animal Industry Act to the disappointment of dairy cattle owners who lobbied for uniform interstate shipping policy to facilitate brucellosis eradication.[81] Since most range cattle owners did not test their animals, they could ship cattle without restrictions. These possibly infected animals could reinfect accredited areas or herds as they moved across state lines.

Dairy and Cattle Industry Groups Lobbying on a Federal Brucellosis Eradication Program

Dairy cattle groups and range cattle groups lobbied in every venue, not just Congress, to shape

[79]F. E. Mollin to the American National Live Stock Association Executive Committee, October 4, 1947.
F. E. Mollin to the State Associations, October 22, 1947, Texas and Southwestern Cattle Raisers Association Records, Box 2P296, Folder – American National Livestock Association Correspondence and Reports, Dolph Briscoe Center for American History, University of Texas at Austin.
Carl Jordan, "The Epidemiology of Brucellosis," in *Brucellosis: A Symposium Under the Joint Auspices of National Institutes of Health of the Public Health Service, Federal Security Agency, United States Department of Agriculture, National Research Council. September 22-23, 1949, Bethesda, Maryland* 100-113 (Washington, D.C.: American Association for the Advancement of Science, 1950).

[80]F. E. Mollin to the American National Live Stock Association Executive Committee, October 4, 1947.
Joe G. Montague to C. E. Weymouth, October 02, 1947, Texas and Southwestern Cattle Raisers Association Records, Box 2P346, Folder – Bang's Disease 1947-1949, Dolph Briscoe Center for American History, University of Texas at Austin.

[81]Charles Brannan to Sam Rayburn.
National Brucellosis Committee, 21.

brucellosis control policy in their favor. Representatives from both groups attended BAI sponsored conferences, regional meetings, and United States Livestock Sanitary Association meetings. At the USLSA, these representatives tried to direct the group's proposals since state animal sanitation boards and the BAI often adopted them. In an attempt not to alienate any state veterinarians or cattle owners, the USLSA tried to build consensus for its brucellosis eradication program. The proposed brucellosis program contained both test-and-slaughter plans and vaccination plans in an attempt to appeal to all cattle owners. The USLSA chose not to endorse one plan over another, but instead to leave the decision to individual cattle owners and their veterinarians. The group also decided to include a compulsion clause to require cattle owners to enter the program if enough other cattle owners in an area approved of the plan. This clause arose from dairy owners' concerns that neighbor cattle would reinfect their herd. In response, range cattle owners from the west and southwest insisted that a supermajority of cattle owners in an area needed to approve of the compulsory element of the program. The compulsory clause of the program only started if 75% of the cattle producers owning 95% of cattle in an area agreed to join the program.[82] The USLSA attempted to keep the interests of the dairy and cattle in balance when developing the brucellosis eradication program so as not to lose the support of one industry group or cause them to protest the proposal as economically unfair, unscientific, or ineffective.

While the dairy and range cattle industry groups disagreed on many aspects of brucellosis control, there were areas of agreement and attempts to work together. In 1949, representatives from across the cattle industry met with veterinarians from the BAI, USLSA, state sanitation commissions, and the American Veterinary Medical Association to form a group that could act as an industry-government cooperative board on national brucellosis control.[83] The group recognized that coming to a

[82]F. E. Mollin to the American National Live Stock Association Executive Committee.
"Bang's Program Approved," 860.
"Bang's Disease Program Modified," *The Cattleman* 35, no. 6 (1948): 14.
[83] Even though the NBC had members of the range cattle industry at its formation meeting, these industry representatives

consensus on issues posed a problem, but eventually they developed some workable concepts. The participants decided that the group would promote education, research, prevention, and legislation in an attempt to create a unified industry approved brucellosis policy with broad industry acceptance.[84] None of the industry representatives fully agreed with the USLSA program, but both range and dairy cattle owners recognized that the majority of states and the BAI approved of the program. "Right or wrong it is a program" and it provided a starting point for discussion of an industry sponsored federal program.[85] Calling themselves the National Brucellosis Committee, the group provided a space for different segments of the industry to voice their opinions on brucellosis control and developed into an industry-wide group advocating for a uniform brucellosis eradication program, more research, and continued education to keep cattle owners aware of new advances in brucellosis knowledge and programs in disease eradication and prevention.

The Accelerated Brucellosis Eradication Program

By the early 1950s, states and individual cattle owners experienced successful outcomes under the USLSA based state programs. After successfully lobbying for unrestricted movement of range cattle, vaccination only plans, and high number triggers for area compulsory plans, resistance to brucellosis control decreased in the range cattle areas. While each of the 41 participating states had their own unique programs for control, nationally the rate of reactors dropped from 5% in 1945 to about 3% in 1951 and 2.6% the next year.[86] The impact of the disease on industry dropped by half from

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were reluctant to fund the committee. Initially, most of the funding came from dairy trade groups and the Kraft Cheese Company. Range cattle groups were reluctant to fund the committee because they were unsure if it or a national industry sponsored plan was necessary.

National Brucellosis Committee, 8, 27.

[84]Ibid., 13.

Joe G. Montague to Bryant Edward, October 24, 1948.

[85]National Brucellosis Committee, 20.

Joe G. Montague to Bryant Edward, October 24, 1948.

[86]"Brucellosis Number One Livestock Disease," 38.

$100,000,000 per year in 1947 to $50,000,000 per year in 1952.[87] With wider industry support and evidence that the program worked, the USDA decided to start a state-federal cooperative program to eradicate brucellosis in 1954. The Accelerated Brucellosis Eradication Program, based on the USLSA program, aimed to complete brucellosis eradication in the country. With an estimated 80% of herds in the United States already brucellosis-free, the USDA hoped increased funding and uniform regulations would lead to the end of the disease.[88]

The state-federal cooperative program was voluntary for states to join though once they did, compulsory elements started. States opted in by a legislative vote, not by a decision of a state's animal health commission, and the states could modify the basics of the plan to address the concerns of their cattle owner constituents. The USDA also accepted suggestions and changes to the federal program made by both the National Brucellosis Committee and The United States Livestock Sanitary Association every year.[89] The Department hoped to start with dairy cattle states and move into range cattle areas. The federal government charged state animal health commissions to run the programs with funding from both the state and the federal government.[90] With $15,000,000 appropriated each year for the first two years of the program for testing, vaccination, veterinarians, and indemnity, the government hoped to continue the progress made over the previous years.[91]

The state-federal cooperative program allowed for three different herd plans, test-and-slaughter, calfhood vaccination, and a combination plan. The program did not pay for adult vaccinations, which had fallen out of favor with veterinarians as a method of brucellosis eradication. The USDA made the

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"Editorial Comment – Bang's on the Way Out," *Hoard's Dairyman* 97, no. 7 (1952): 338.

[87]"Editorial Comment – Bang's on the Way Out," 338.

[88]United States Department of Agriculture, *Highlights of the Accelerated Brucellosis Eradication Program* (Washington, D.C.: United States Government Printing Office, 1954), 1.

Council of State Governments, United States Department of Agriculture, and United Livestock Sanitary Association, 1.

[89]S.H. McNutt, "Recommendations of the National Brucellosis Committee," in *National Brucellosis Committee Proceedings 196*5 58-59 (Washington D.C.: United States Department of Agriculture, 1965).

[90]"Bang's Program Approved," 860.

[91]"Dairy Digest," *Hoard's Dairyman* 99, no. 21 (1954): 935.

program voluntary since range cattle owners opposed a compulsory program. Cattle owners chose to enter the program, but once herd owners joined the program, they had to abide by the guidelines of their chosen plan. If enough cattle owners in one area wanted an eradication program, the state could mandate brucellosis control in the area. If 75% of livestock owners owning 51% of the livestock in an area (usually a county) entered the program, the rest of the livestock owners had to join one of the plans.[92] This detail of the program addressed the concerns of accredited herd owners about herd reinfection by neighbor cattle. If enough cattle owners wanted brucellosis control, the state had the authority to force resisting local cattle owners into compliance.

The USDA program also banned commercial laboratories from manufacturing strain 19 vaccine and untrained veterinary medical workers from administering it.[93] Extensive use of the vaccine since the early 1940s revealed that it was not 100% effective in providing immunity against Bang's. Many veterinarians thought that inconsistent vaccine concentration, layman vaccinators, and untrained veterinarians distributing and vaccinating animals led to incomplete immunity.[94] By restricting the manufacture of the vaccine and only providing funding for inoculation if performed by a designated state officials or veterinarian, the USDA tried to ensure a consistent rate of immunity granted by strain 19 vaccination.

The USDA also created the first Uniform Methods and Rules (UMR) for brucellosis eradication with the state-federal cooperative program. These rules established a national definition of vaccination status, reactor status, and interstate movement, rules for identification of vaccinates and reactors, rules

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[92]F. E. Mollin to the American National Live Stock Association Executive Committee.
[93]Brucellosis Control and Eradication Act, 8-9.
[94]"Editorial Comment – Lay Testing – Vaccinating," *Hoard's Dairyman* 93, no. 4 (1948): 160.
F.E. Mollin to C.E. Weymouth, October 20, 1947, Texas and Southwestern Cattle Raisers Association Records, Box 2P346, Folder – Bang's Disease 1947-1949, Dolph Briscoe Center for American History, University of Texas at Austin.
W.A. Hagan et al., *Report of the U.S. Committee of Consultants Appointed by the Secretary of Agriculture to Review the Accelerated Program of the Federal Government in Cooperation with the States and Territories, to Control and Eradicate Bovine Brucellosis in the United States* (Washington, D.C.: United States Department of Agriculture, 1956), 9.
George H. Conn, "How These Veterinarians Control Bang's Disease in Infected Adult Cattle Herds," *The Cattleman* 29, no. 7 (1943): 63-64.

for testing cattle before and after interstate shipment, and standards for modified-accredited and accredited status.[95] This move addressed cattle owners' and veterinary medical officers' concerns about each state having its own set of definitions and rules for what made an animal a reactor and unfit for sale to accredited herds. Though not legally binding, the UMR served as the roadmap for state legislation on brucellosis and federal interstate shipping laws and brucellosis legislation rarely deviated from its parameters. The amendment also moved the power of accreditation from the state to the federal government. State veterinarians still certified herds, but the federal government controlled the definitions for certification. With national accreditation a brucellosis-free animal had the ability to smoothly move across state lines with limited testing and waiting.[96] The UMR made it easier to transport and sell cattle across state lines and closed the loophole for untested cattle created by the 1951 amendment to the Animal Industry Act.

Many range cattle owners still objected to any compulsory plans, but the voluntary nature of the Accelerated Brucellosis Eradication Program met with their approval.[97] The program also allowed for differences between dairy and range cattle. Not only did it allow variation by state and encompass both test-and-slaughter and calfhood vaccinations, but it also had flexibility built into the individual plans. For those in a plan with inoculation, dairy calf vaccinations occurred between 4 and 8 months while beef calf vaccinations occurred between 4 to 12 months. This accounted for the differences in the maturation of dairy and beef herds and allowed range cattle owners to vaccinate cattle when they had normal roundups.[98] To accomplish the goal of eradication, the USDA kept the program as inclusive and adaptive as possible.

In order to develop a flexible state-federal brucellosis eradication program and the UMR that

[95]United States Department of Agriculture Agricultural Research Service, *Bovine Brucellosis Eradication: (Recommended) Uniform Methods and Rules* (Washington, D.C.: U.S. Department of Agriculture, 1960).
[96] Brucellosis Control and Eradication Act, 7-8.
[97]"Resolutions Adopted at the 78th Annual Convention," *The Cattleman* 41, no. 11 (1955): 23.
[98]Ibid., 23.
"Bang's Program Approved," 860.

could adapt to an individual herd, the USDA consulted state animal health officials, veterinarians, and industry representatives. All of these groups participated in USLSA discussions and NBC meetings so the development of the program and changes to it reflected the interests of all these different groups. The Department was particularly mindful to have industry input in order to assure industry support of the program.[99] Having the approval of an industry group usually assured the participation of individual members and without the participation of individual herd owners, the program would stall. As under the state program, individual cattle owners remained the key to eradication under the Accelerated Brucellosis Eradication Program. Cattle owners chose to enter the program, what plan to follow, and only cattle owners had the authority to vote an area into the program. The state-federal program essentially operated as an industry-state-federal program since industry members shaped policy and participation in the program.

Conclusion

During the decade after World War II, states and the Department of Agriculture developed a state-federal brucellosis eradication program through a cooperative effort with both dairy cattle owners and range cattle owners in order to ensure the program's success. After the war, the rate of positive reactors among tested cattle dropped as did the annual number of human cases, though the USDA still listed brucellosis as the most expensive disease in terms of lost revenue. Many states had some form of brucellosis control legislation, but each state had its own rules to prevent the spread of the disease, including different shipping laws for each state. Some states required vaccinations, while others required testing of all animals, and some states had no regulations at all. This frustrated many cattle owners who transported cattle interstate since they had to navigate the sometimes contradicting state regulations. While some cattle owners wanted uniform regulations to ease transportation of cattle, other

[99] United States *Department of Agriculture, Highlights of the Accelerated Brucellosis Eradication Program,* 2.

herd owners wanted a uniformed national eradication program because they worried about reinfection of their disease-free herds. They thought that the only way to keep their animals free of brucellosis was to completely eliminating it in all cattle across the nation.

While many dairy cattle owners wanted a state-federal brucellosis eradication cooperative, other cattle owners rejected the concept of a USDA guided eradication program like those for tick fever or tuberculosis. Many members of the range and semi-range industry opposed an effort to standardize Bang's programs and regulations because they viewed the disease as a problem for the dairy industry. To these cattle owners, federal funding for brucellosis eradication operated as a subsidy, just like the original funding from the Agricultural Adjustment Act and the associated regulations stifled their business. In addition, range cattle owners thought that the focus on brucellosis and attempts to eradicate it diverted funding from diseases that posed a greater threat to their herds. The reemergence of foot-and-mouth disease in Mexico impacted many range cattle owners in the southern United States and Great Plains more than Bang's. They wanted the Department of Agriculture to create programs and spend funds to control these problems rather than brucellosis.

In order to address the concern of states, animal health officials, veterinarians, and cattle owners who wanted a national program and those who rejected the concept, the Bureau of Animal Industry took steps towards unifying state brucellosis eradication efforts in the 1940s without actually creating a state-federal program. In 1944, the bureau approved three methods of controlling the disease. This flexible herd planning allowed cattle owners and states to choose their method of brucellosis eradication. However, all three recommended options involved testing of cattle which many range cattle owners disliked because it required them to round up their herds more frequently than usual. Range industry groups and many veterinarians who worked with range animals preferred programs that only required vaccination with no testing since calves could be vaccinated as part of routine round-ups. States with significant meat producing industry continued to fund vaccination programs or provided no

coordination for brucellosis control.

Flexible herd plans became popular in states that adopted the Bureau of Animal recommended program. Building on this success in 1947, the United States Livestock Sanitary Association proposed that the USDA create a state-federal brucellosis eradication program with four different herd plans including two plans that involved vaccinating herds with no testing. This solution allowed cattle owners to choose their method of disease control and hopefully gain the support of range cattle owners who resisted national brucellosis regulations if they had to test their animals. Within a year, 41 states adopted all or parts of the USLSA program though the BAI still did not create a uniform eradication program. While states began adopting more uniform herd plans, cattle owners who shipped their animals interstate continued to navigate a maze of regulations that varied from state to state. In 1949, the Bureau of Animal industry asked Congress to pass legislation to regulate interstate shipping of cattle and in 1951, a bill passed though it contained loopholes that allowed for the shipment of untested animals. Both groups who supported the federal eradication effort and those who opposed it had lobbied Congress to create a bill that favored their interests. The resulting changes to the interstate shipping regulations reflected the success of both those who had advocated for uniform regulations for Bang's and those who did not want to test their cattle for the disease.

Dairy and range industry groups lobbied not only in Congress to shape brucellosis eradication policy but also at USLSA meetings, conferences, and regional animal disease control meetings. While these groups often disagreed with each other on how to handle brucellosis infection, they tried to work together to develop a state-federal program that would appease most cattle owners and allow them to control the disease as they desired. In 1949, veterinarians, animal health officials from states and the Department of Agriculture, and representatives from across the cattle industry met to form the National Brucellosis Committee. This group decided to advocate for educating cattle owners about the disease, for more research to improve understanding of Bang's, encouraging prevention of the infection, and

lobbying for legislation that created a uniform industry approved state-federal eradication program. The National Brucellosis Committee allowed different stake-holders and segments of the cattle industry to work together on the issue of brucellosis and propose a unified eradication program that had broad industry support.

During the early 1950s, the percentage of brucellosis reactors in the country continued to drop since the majority of states adopted some form of the United States Livestock Sanitary Association program for eradication. This success bred support for the flexible plans even in range cattle areas that had rejected coordinated attempts to control the disease in the 1940s. The Department of Agriculture capitalized on the decreasing prevalence of Bang's and the increased approval for the control effort by creating the Accelerated Brucellosis Eradication Program in 1954. Like the USLSA program the state-federal cooperative had flexible plans including test-and-slaughter and vaccination only to meet the needs of different parts of the cattle industry. The department also created a Uniform Method and Rules for the program that dictated the minimum requirements for each state that participated in the program and established uniform interstate shipping laws related to Bang's. The program was designed to be a cooperative not only between states and the federal government but also the cattle industry and veterinarians. Cattle owners and veterinarians lobbied for changes to the program through the National Brucellosis Committee, the United States Livestock Sanitary Association, and state legislatures. Once a state adopted the program, participation remained voluntary and cattle owners chose which of the approved programs to follow. The industry-state-federal program developed due to the cooperative effort of different parts of the cattle industry, veterinarians, and animal health officials. Flexible herd plans that allowed for testing and vaccination, the adoption of industry input and considerations, and the success of the voluntary programs created an environment that allowed the government to implement a bovine brucellosis eradication program with support from all parts of the cattle industry. Department of Agriculture officials aimed to continue the Bang's eradication effort started under state

and voluntary programs during the 1930s and 1940s and eventually eradicate the disease in the Unites States.

Chapter 5: The Accelerated Brucellosis Eradication Program 1955 – 1970

When the Congress and the Secretary of Agriculture authorized the Accelerated Brucellosis Eradication Program in September 1954, the prevalence of bovine brucellosis had already greatly declined in the United States to about 2.6%[1]. Designed to totally eradicate the disease as more herds and areas became certified brucellosis-free through testing and vaccination, the program relied on the cooperation of cattle owners along with state and federal veterinary medicine officials. In order to expand existing brucellosis control efforts into an official state-federal eradication program, the problems of testing, identification, veterinarian participation, and industry participation had to be addressed. Working with local animal health officials, veterinary and human medicine researchers, and industry groups to deal with these issues, the USDA grew the brucellosis eradication program in the 1950s and 1960s from 341 modified certified counties when the program began to 97.3% of all counties being modified certified or brucellosis-free by the end of 1969.[2] While the eradication program experienced success over its first ten years, it faced increased criticism by the middle of the 1960s as the policy on interstate transportation of cattle changed. Cooperation and compromise along with legal action quieted most of the eradication program's critics and by the end of the 1960s, the goal of brucellosis eradication seemed achievable.

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[1]The program did support eradication in swine and goats as well as cattle, but bovine brucellosis represented the main focus of the program when it began in the mid-1950s.
The decreasing rate of brucellosis occurred around the same time as farmers began using antibiotics in feed, but the use of antibiotics did not contribute to the decreasing rate of the disease. Just as in humans, antibiotic treatment for brucellosis required multiple types of the drug administered as specific time intervals and there was no guarantee of a positive outcome. It was too expensive and difficult to cure animal brucellosis through the use of antibiotics.
United States Department of Agriculture, *Highlights of the Accelerated Brucellosis Eradication Program* (Washington, D.C.: United States Government Printing Office, 1954), 1.
John T. Schlebecker, *Cattle Raising on the Plains, 1900-1961* (Lincoln: University of Nebraska Press, 1963), 217.
Susan D. Jones, *Valuing Animals: Veterinarians and Their Patients in Modern America* (Baltimore: Johns Hopkins University Press, 2003) 107-109.

[2]United States Department of Agriculture, *Cooperative State Federal Brucellosis Eradication Program: Statistical Tables, Fiscal Year 1959* (Washington, D.C.: United States Department of Agriculture, 1959), 9.
Livestock Conservation, Inc., and Cooperative State-Federal Brucellosis Eradication Program, *1970 Proceedings of the National Brucellosis Committee of Livestock Conservation, Inc., and Progress report of the Cooperative State-Federal Brucellosis Eradication Program* (Washington, D.C.: United States Department of Agriculture, 1970), 2.

The creation of the Accelerated Brucellosis Eradication Program and the Uniform Methods and Rules (UMR) regarding brucellosis finally established national regulations on testing, cattle identification, and interstate transportation and set the definitions of a reactor, a modified certified area, and a certified brucellosis-free area.[3] As a cooperative program, each state passed its own legislation on the eradication effort and each state set its own rules for intrastate transport and participation. Since each state had its own variation on the federal policy for brucellosis eradication, having uniform definitions and standards provided the necessary framework to build a national program. By following the UMR, each state, area, and cattle owner worked off the same template and adopted the same methods of testing and standards for certification. Without these regulations, the new eradication program would be the same as the control programs of the 1930s, with the federal government providing funding for state programs and cattle owners unable to transport cattle to and from states with different brucellosis control standards.

Implementation of the Uniform Methods and Rules

Applying the Uniform Methods and Rules in each participating state and herd created precise definitions for the brucellosis status of each animal or herd. The individual animal was the basic unit for the program and brucellosis status grew out of the status of a particular cow, bull, or calf. Each animal had to be blood tested and declared either a reactor or not according to the standardized blood titer regulations. Any reactors had to be branded and either isolated or sold for immediate slaughter.[4] Only once every individual animal in the herd tested negative could a herd become certified brucellosis-free. The certification of herds in an area then contributed to the status of an area as

[3]United States Department of Agriculture Agricultural Research Service, *Brucellosis Eradication: Recommended Uniform Methods and Rules* (Hyattsville, MD: United States Department of Agriculture, 1967).
[4]United States Department of Agriculture Agricultural Research Service, *Bovine Brucellosis Eradication: Recommended Uniform Methods and Rules* (Washington, D.C.: U.S. Department of Agriculture, 1963), 6.

modified certified or certified brucellosis-free.[5] The status of the areas in a state led to the designation of a state as modified certified or brucellosis-free.[6] The classification of herds, areas, and states relied on testing of cattle and their disease status. Under the state-federal cooperative program, each animal contributed to the health status of cattle in a larger unit. The reactor status did not transfer from animal to animal, but the reactor status of an animal impacted the health status of other animals. Cattle owners had to eradicate brucellosis from each animal in their herd, their area, and their state to achieve accreditation and the advantages of being certificated. The state-federal cooperative program relied on individual animals and cattle owners to achieve its goal of brucellosis eradication.

The implementation of the Accelerated Brucellosis Eradication Program and the UMR expanded the authority for certification of bovines as brucellosis-free to states and the federal government. Through the regulations of the eradication program, the government designated cattle and herds as healthy or not healthy. Just as state sponsored contagious abortion plans lent government credibility to the status of brucellosis-free herd in the 1930s, the state-federal cooperative program placed the power of the federal government behind the certification status of individual herds.[7] When a cattle owner in the program claimed he or she had a disease free herd, it came with the endorsement of both the state and federal government. This endorsement facilitated easier transportation of animals

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[5]Certified brucellosis-free areas were allowed to have reactor cattle as long as the accounted for less than 0.02% of cattle in less than 1% of the herds in the area. Each area usually encompassed a county, but states were allowed to create special areas. These areas could incorporate parts of counties into one area as long as they were contiguous. This way states could work around one or two resisting cattle owners and create an area that could reasonably become modified certified or certified brucellosis-free.
Ibid., 21.
"Brucellosis Legislation," *The Cattleman* 46, no. 2 (1959): 14-16.

[6]As mentioned in the previous chapter, in order to enter a county into the eradication program, a majority of cattle owners who owned the majority of cattle in an area had to approve of entering the program. This put the responsibility for participating in the program on cattle owners, making the eradication program an industry-state-federal cooperative. The same held true on the state level. The state could only legally compel cattle owners and counties to operate under a modified certified plan once 90% of the areas representing the majority of cattle owners in the state entered the program. This gave states the power to deal with holdouts, but not without the approval of the majority of the cattle industry in the state.
United States Department of Agriculture Agricultural Research Service, *Bovine Brucellosis Eradication: Recommended Uniform Methods and Rules* (Washington, D.C.: U.S. Department of Agriculture, 1960), 4.

[7]United States Department of Agriculture Agricultural Research Service, *UMR*, 1967, 1.

acting like a passport for interstate and intrastate sale and travel.[8] The movement of cattle from certified herds remained relatively unrestricted while non-certified cattle of breeding age required blood testing to move interstate.[9] Some states also restricted the movement of non-certified cattle in each state so certification became a valuable asset for those who traded and sold cattle to other herds.

The Role of Veterinarians

In order to gain certified status, herds had to undergo blood testing done by a veterinarian. In addition, all vaccinations had to be administered by a veterinarian and under the UMR, the Accelerated Brucellosis Eradication Program in an area had to be supervised by a full-time state or federal certified veterinarian.[10] Some of those who opposed the brucellosis eradication program worried about giving up control of their herd's health to veterinarians, but most cattle owners accepted veterinary medicine practitioners as part of the price of having a healthy herd. In the 1950s and 1960s, farmers and producers saw veterinarians as tools to get the most economic value out of their animals and their products. Unless the treatment of the animal cost more than the economic loss due to the disease, agricultural producers utilized veterinarians and veterinary medicine to develop healthier animals.[11] With the regulations on movement of animals from non-certified herds and local dairy regulations prohibiting the sale of milk from non-certified herds, the economic advantages of having brucellosis-free cattle, especially for dairy cattle owners, continued to grow.[12] Since most states and the federal

[8]"Editorial Comment - Test to Move Interstate," *Hoard's Dairyman* 101, no. 6 (1956): 304.

[9]In order to add an animal to a certified herd, the animal had to come from a herd of equal status or a herd with negative tests within the past twelve months. Animals from negative testing herds had to be individually tested within a month of movement and animals from herds with infection had to pass a test before and after movement. Exceptions to all of these rules applied to official vaccinates under thirty months who had not been bred.
United States Department of Agriculture Agricultural Research Service, *UMR*, 1963, 9 -10.

[10]Ibid., 5

[11]Susan D. Jones, *Valuing Animals: Veterinarians and Their Patients in Modern America* (Baltimore: Johns Hopkins University Press, 2003), 111-112.

[12]Taking advantage of the new state-federal cooperative program and its regulations for certification, in 1955, Chicago became the first city to require that all milk come from certified brucellosis-free herds. Most dairy cattle owners in the region had already achieved this status, but the new law pushed those who had not complied yet into the new eradication

government paid for the veterinarians, many cattle owners accepted veterinary supervision of their herds as a way to increase their value through brucellosis eradication and prevention without cost to themselves.

The implementation and expansion of the brucellosis eradication program required the contribution of a large number of man-hours from veterinarians and not just the cooperation of cattle owners. As discussed in previous chapters, blood testing for brucellosis tested not for the presence of the bacterium, but for the presence of the antibody to it. Agglutination testing remained the standard for testing cattle for brucellosis under the state-federal cooperative program and that, combined with the long incubation period of disease, meant that cattle required multiple blood tests over a series of months to qualify for certification status.[13] For cattle herds in combined or vaccine plans, vaccination had to be performed on calves from four to eight-months-old to be considered official vaccinates according to the UMR. These restraints generated a large amount of time sensitive work for veterinarians in order to declare a herd brucellosis-free or a calf as a vaccinate. Unable to meet demands through the efforts of state and federal veterinary medical officials, many states paid private veterinarians to administer vaccinations and perform blood tests.[14] In order to encourage veterinarian participation, the USDA changed payment to veterinarians to match local levels for fees and paid per head instead of per day.[15] Even with additional help to test and vaccinate cattle, the lack of veterinarians to supervise herds often served as a limiting factor for initially expanding the program.[16]

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program.
"Editorial Comment – Bang's Is on Way Out," *Hoard's Dairyman* 100, no. 2 (1955): 76.
"Editorial Comment – Wisconsin Is All "Plan A"," *Hoard's Dairyman* 100, no 13 (1955): 638.
Proceedings of the North Central State Bang's Disease Conference (Saint Paul, MN: 1953), 2.

[13]United States Department of Agriculture Agricultural Research Service, *UMR*, 1963, 7-8.

[14]Ibid., 6.
Joseph M. Arburua, *Narrative of the Veterinary Profession in California* (San Francisco: 1966), 98 – 100.
A.K. Kuttler, *Progress Report on Brucellosis Eradication* (Washington, D.C.: United States Department of Agriculture, 1956), 5.

[15]United States Department of Agriculture, *Highlights of the Accelerated Brucellosis Eradication Program*, 5.

[16]United States Cooperative State-Federal Brucellosis Eradication Program, *Progress Report on Cooperative State-Federal Brucellosis Eradication Program, 1959, ARS 91-9* (Washington, D.C.: United States Department of Agriculture

Certification Testing

While cattle owners waited to have their cattle officially blood-tested for the certification process, a new testing technique facilitated recertification. Developed by the University of Minnesota in 1949, the brucellosis ring test (BRT) provided dairy cattle owners of certificate herds with a quick, easy, and cost effective method of testing a herd for the disease without having to sample the blood of each individual animal.[17] Just like the agglutination test, the BRT checked for the presence of brucellosis antibodies, but instead of blood, it utilized milk or cream produced by each herd. If the milk or cream tested positive then state and federal animal health officials could trace it back to the herd that produced it and blood test each animal for the disease.[18] The UMR included BRT standards for monitoring the disease status of a certified herd at the request of the dairy industry, moving the testing from the individual animal to the herd as a whole.[19] Only a suspicious or positive brucellosis ring test led to each animal in a herd being tested. Utilizing this test for recertification put less burden on both dairy cattle owners and veterinary medical officials and reduced costs for the program.

At the start of the eradication program, no alternatives to herd blood testing existed for meat or range cattle, though they did have special concessions built into the Uniform Methods and Rules. These

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Agricultural Research Service, 1959), 3.
United States Department of Agriculture, *Speech Notes for the Accelerated Brucellosis Eradication Program* (Washington, D.C.: United States Department of Agriculture, 1954), 11.

[17]Testing of dairy products for brucellosis is now known as the brucellosis milk surveillance test (BMST) rather than the brucellosis ring test.
United States Department of Agriculture Animal and Plant Health Inspection Service, *Brucellosis Eradication: Uniform Method and Rules, Effective October 1, 2003* (Washington, D.C.: United States Department of Agriculture, 2003), 81, http://www.aphis.usda.gov/animal_health/animal_diseases/brucellosis/downloads/umr_bovine_bruc.pdf (accessed June 10, 2013).
C. M. Jones, *One Hundred Years of Inquiry and Innovation: An Illustrated History of the American Dairy Science Association* (Long Prairie, MN: Banta, 2006), 58.

[18]United States Department of Agriculture Agricultural Research Service Animal Disease Eradication Division, *Procedures and Approved Methods for Conducting Brucella Ring Tests, B.R.T.* (Washington, D.C., 1965), 1-8.
Lowell R. Barnes, "Market Cattle Testing Program – Need for Increased Coverage," in *1970 Proceedings of the National Brucellosis Committee of Livestock Conservation, Inc., and Progress report of the Cooperative State-Federal Brucellosis Eradication Program* 17-18 (Washington, D.C.: United States Department of Agriculture, 1970).

[19]United States Department of Agriculture Agricultural Research Service, *UMR*, 1963, 11-16.

exceptions for range cattle existed because the state-federal program still needed industry participation to work (as discussed in the previous chapter). In order to gain support for the program from range cattle owners, the Department of Agriculture created special exceptions for areas and herds designated range or semi-range. These areas could be declared modified certified areas once all dairy and purebred cattle in an area were tested, but only 20% of range cattle in the same area needed to be tested and limited number of reactors found.[20] This allowed for greater area participation in the program with minimal inclusion of range cattle owners. In addition to the exceptions in the UMR, animal health officials in range cattle states worked with the USDA and range cattle organizations to create state laws that complied with the state-federal program guidelines and addressed the concerns of range cattle owners. Texas formally joined the state-federal program in 1959 after years of negotiation between cattle owners and government authorities over the role of vaccination in eradication and the ability of trained lay technicians to test and vaccinate cattle.[21] Flexibility in the state-federal cooperative program allowed states to address the concerns of their cattle owners while still complying with federal regulations. By addressing the concerns of local cattle owners, states assured higher participation by these cattle owners.

Education and Advocacy

As states began their eradication programs, cooperation between state agencies, animal and

[20]United States Department of Agriculture Agricultural Research Service, *UMR*, 1963, 12.

[21]The Texas brucellosis control program allowed for two types of designated brucellosis control areas. One type of control area followed the traditional UMR regulations for certifying counties while the second type of control area only required all female calves in the county to be vaccinated. This policy stemmed from the belief by many cattle owners that brucellosis in range cattle could be eradicated by vaccination alone.
The USDA allowed lay technicians certified by the Texas state livestock sanitary commissions to administer vaccinations and tests. This reduced wait times and ensured that cattle in remote areas of the state that lacked access to veterinarians could still be officially tested and vaccinated.
"Brucellosis Legislation," 14-16.
"Brucellosis Plan Endorsed by Texas and Southwestern Cattle Raisers Association," *The Cattleman* 45, no 10 (1959): 29-31, 34-35.

human public health groups, and industry became critical to starting and expanding the eradication program. The implementation of the program in an area hinged on cattle owners' approval so states and the federal government called upon industry to develop and promote eradication efforts. USDA officials and the National Brucellosis Committee (NBC) advised states to create brucellosis committees with representatives from farm organizations, livestock producers, rural women's organizations, public health departments, state medical associations, farm press, and other relevant interest groups with government, research, and private veterinarians serving as advisers to the committee.[22] By having representation from a variety of industry and health sectors, these committees appealed to all parts of the affected industry and provided an opportunity for all groups related to brucellosis eradication to have a voice in state programs. Just as the program was an industry-state-federal cooperative so was the effort to encourage participation and manage the program in an area.

Charged with creating area eradication campaigns, the committees organized county meetings, planning sessions, and coordinating the petitions for area inclusion.[23] They reached out to areas, using education and organization to start and operate successful area programs.[24] Counties or areas served as the smallest unit of cooperation for entering the program, so states worked to tailor education and information to each specific area.[25] They worked with cattle owners and veterinarians to encourage participation and even reached out to other groups in the community as potential sources of education and encouragement for the program. Banks and business groups became potential advocates who stressed the economic advantages of having certified cattle for interstate shipment and public health groups spread information on protecting those on the farm from undulant fever including cattle owners'

[22]United States Department of Agriculture, *Highlights of the Accelerated Brucellosis Eradication Program*, 6.
United States Federal Extension Service, United States Department of Agriculture Agricultural Research Service, and National Brucellosis Committee, *Suggestions for a Brucellosis Eradication Program: Ideas That Have Worked* (Washington, D.C.: United States Department of Agriculture, 1958), 2.
[23]Ibid., 4.
[24]Ibid., 1.
[25] Ibid., i.
United States Department of Agriculture, *Highlights of the Accelerated Brucellosis Eradication Program*, 7.

families.[26] Committees targeted their education efforts to other parts of the farm family too. Home demonstration agents, rural women's groups and agriculture programs in high schools, colleges, and 4-H Clubs organized meetings and demonstrations about the state-federal program aimed at women and future farmers.[27] Every part of the farming community was turned into a potential place of education and awareness about brucellosis and the state-federal eradication program, not just the traditional farm organizations and veterinarians. Since brucellosis eradication and an area's status impacted the entire community, the entire community played a role in encouraging participation in the program.

Federal and state officials developed and tailored eradication program education to each area and worked with local agents to increase participation in the state-federal cooperative program with education as the primary tool to encourage inclusion and keep producers up to date on the work in their area. They wanted cattle owners to know

> "why" the program is necessary, "how" it is carried out, and "who" does it. As the program progresses he also needs to know "when," "what," and "where" . . . so he will be in a better position to cooperate. Timing is important. As target dates for testing are set up in local areas, an organized plan of information and education should proceed . . . and then follow as the testing program is carried out.[28]

Committees used education to encourage participation and then used it to ensure that cattle owners remained interested in the program until eradication of the disease. Both the USDA and the NBC advocated for continued education, community support, and providing program updates until all herds in the area were brucellosis-free. They worried about a loss of interest in the program once a cattle

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[26]United States Federal Extension Service, United States Department of Agriculture Agricultural Research Service, and National Brucellosis Committee, 5.

[27]United States Federal Extension Service, United States Department of Agriculture Agricultural Research Service, and National Brucellosis Committee, 8.
Ruth R. Clark to Florence Hall, February 1, 1949, RG33, Box 110, Entry NC-117, 3A, July 1 to March 31, United States National Archives.

[28]United States Department of Agriculture, *Highlights of the Accelerated Brucellosis Eradication Program*, 7.

owner cleaned his or her herd, an area became disease free, or a state gained certified status.[29] If cattle owners became complacent in vaccination or testing, then the disease could reemerge in an area due to reintroduction.[30] Education and support did not end once an area began its eradication program, but continued as long as brucellosis remained a threat to the area, state, and country.

Just as they did in the past, the Department of Agriculture, the Federal Extension Service, land-grant universities, and professional organizations like the United States Livestock Sanitary Association and the National Brucellosis Committee published educational material about brucellosis to distribute to cattle owners, veterinarians, the press, and other parts of the farming community. Not only did they provide information in the traditional format of agricultural bulletins, leaflets, and articles in trade journals, but they also took advantage of other media such as radio, film, television, and exhibits including one with an animated central panel that showed the threat of the disease to dairy herds, beef herds, and humans.[31] Local groups also contributed to the education effort by releasing progress reports through local newspapers, radio stations, and television programs and presenting local success stories through this media.[32] While much of the knowledge and education on brucellosis came from national sources, local reports on the program related this national knowledge to local situations.

Industrial Economic and Animal Public Health Rhetoric

The educational material from national and local sources contained an array of information on

[29]United States Federal Extension Service, United States Department of Agriculture Agricultural Research Service, and National Brucellosis Committee, 1.

[30]While states required testing to move animals, the fines for moving cattle without papers remained relatively insignificant. Dairy industry publications and groups like *Hoard's Dairyman* wanted stronger fines for transporting cattle without brucellosis health papers to discourage situations that led to reinfection of a herd or an area. They likened the movement of diseased cattle to biological warfare because it caused the same serious effect as the use of weaponized brucellosis. These dairy cattle owners wanted judges to punish harshly those involved with illegal transport of diseased animals. "Editorial Comment – Fined $100 for Spreading Disease," *Hoard's Dairyman* 101, no. 22 (1956):1134. "Editorial Comment – Keep Vaccinating," *Hoard's Dairyman* 102, no. 10 (1957): 540.

[31]United States Department of Agriculture, *Highlights of the Accelerated Brucellosis Eradication Program*, 8-9.

[32]Ibid., 8.

brucellosis focused on justifying the eradication effort to cattle owners. Economic benefit remained the primary argument for eradication, but rhetoric about controlling the disease to prevent undulant fever in the human population served as a significant justification along with the economic reasons. The Accelerated Brucellosis Eradication Program formalized the inclusion of public health officials and medical researchers into the eradication effort that had been going on since the initial research into cattle abortion storms. The USDA and NBC encouraged inclusion of public health officials on state eradication committees and supplied educational material from United States Public Health Service on the human disease.[33] They also supported discourse and education about brucellosis in humans on the national level. The National Brucellosis Committee dedicated a committee member spot to a representative from the American Medical Association who reported on undulant fever at annual meetings.[34] The Department of Agriculture included information on the danger of brucellosis to man in the material produced by agricultural organizations. The USDA film, *The Triple Threat of Brucellosis,* tied economics and health together by illustrating how milk and meat served as pillars of strength for the United States economy and the health of its people. This educational movie featured an interview with Alice Evans on her experience as a sufferer of chronic undulant fever and focused on the occupational risk of disease rather than the consumer risk of the disease.[35] As discussed in the previous chapter, the risk of consumer brucellosis decreased after World War II and occupational cases became the focus of public health and veterinary medical officials working on undulant fever. The shift of rhetoric in educational material to focus on occupational cases, the close work between those in animal and human public health, and public health officials' involvement with cattle producers on state eradication committees altered the rhetoric of industry to include both industry economic and human

[33]United States Department of Agriculture, *Highlights of the Accelerated Brucellosis Eradication Program*, 4, 9.
[34]United States Department of Agriculture and National Brucellosis Committee, *National Brucellosis Committee: 1965 Proceedings*, (Washington, D.C.: United States Department of Agriculture, 1965), ii.
[35]*The Triple Threat of Brucellosis*, prod. United States Department of Agriculture Office of Public Affairs, 1951, film reel.

public health justifications for the brucellosis eradication program.[36] The initial revelation of the relationship between milk and undulant fever led to the connection of economics and health in 1929, but at that time, producers and veterinary medicine officials downplayed undulant fever control as justification and couched the discussion of human health in economic terms. By the mid-twentieth century, human health concerns about brucellosis gained more equal footing as justification for control of the disease in animals as the targeted population [37] The two diseases, Bang's and undulant fever, had long been defined as one disease, brucellosis, and the control of the human disease always relied on the control of the animal disease, but the state-federal eradication program formalized this relationship and encouraged industry to think about both industry economics and occupational health as reasons for control.

A new reason for the eradication program also emerged along with the economic and health justifications. Proponents of the state-federal program argued that since the disease was already under control in many herds and many states already had control plans that "THERE IS GOOD REASON FOR STEPPING UP THE PROGRAM NOW! We've got brucellosis on the run . . . It's simple logic - - and good economics - - to wipe out brucellosis NOW!"[38] The already reduced prevalence of the disease became a justification for an official state-federal cooperative. Since herds and states controlled the disease on their own, then eradication nationally was possible.[39] The shrinking number of cattle with brucellosis also changed the facts about the disease, which strengthened the argument for federal

[36]"Brucellosis Legislation," 42.
James Steele, "Human Brucellosis in the United States 1964," in *National Brucellosis Committee: 1965 Proceedings* 27-36 (Washington, D.C.: United States Department of Agriculture, 1965).
F. E. Mollin to the American National Live Stock Association Executive Committee, October 4, 1947, Texas and Southwestern Cattle Raisers Association Records, Box 2P296, Folder – American National Livestock Association Correspondence and Reports, Dolph Briscoe Center for American History, University of Texas at Austin.
[37]United States Department of Agriculture, *Speech Notes for the Accelerated Brucellosis Eradication Program*, 6.
Wesley W. Spink, "Public Health Aspects of Brucellosis," in *Northeastern States Brucellosis Conference* 31 (New York, 1949).
"Editorial Comment – Disease Cleanup Continues," *Hoard's Dairyman* 110, no. 6 (1965): 386.
[38]United States Department of Agriculture, *Highlights of the Accelerated Brucellosis Eradication Program*, 1.
[39]"Editorial Comment – Bang's Is on Way Out," 76.

control of the disease. The USDA had the authority only to control epizootic animal diseases that threatened the country's economy. When the disease was enzootic in every state, some cattle owners and veterinarians argued that the government had no right to implement federal control. As states and areas eliminated brucellosis in their herds, the disease became more like tick fever, enzootic in some areas and potentially epizootic if spread to brucellosis-free locations. As a result, the government claimed the right to regulate brucellosis as a potentially epizootic disease.[40] The reduced rate of brucellosis not only created justification for a state-federal program to finally eliminate the disease, but it also gave the federal government authority to control the disease.

Growth of the Accelerated Brucellosis Eradication Program in the Late 1950s and Early 1960s

Whether cattle owners wanted to control brucellosis for economic reasons, health reasons, or for both, the state-federal brucellosis cooperative eradication program quickly grew once it formally began. The USDA expected rapid process and set a goal for a modified certified brucellosis-free nation by 1960.[41] Since many dairy herd owners and states already had some control eradication program in place, some areas started the program with modified certified status and that number grew quickly.

[40]Charles Brannan to Sam Rayburn, May 28, 1951 RG16, Records of the Office of the Secretary of Agriculture, General Correspondence 1906-197, Box 1947-1951, Legislation 1-1(22), United States National Archives.
A Bill to Amend the Act of May 29, 1884, RG16, Records of the Office of the Secretary of Agriculture, General Correspondence 1906-1975, Box 1947-1951, Legislation 1-1(22), United States National Archives.
[41]United States Federal Extension Service, United States Department of Agriculture Agricultural Research Service, and National Brucellosis Committee, 8.

Image 5.1: Map of the Cooperative State-Federal Accelerated Brucellosis Eradication Program from September 30, 1954 from USDA Statistical Tables[42]

The Accelerated Brucellosis Eradication Program started with only 341 modified certified counties in September, 1954. Within three years, 735 counties qualified as modified certified and another 712 completed testing under the program.

[42]United States Department of Agriculture, *Cooperative State Federal Brucellosis Eradication Program: Statistical Tables, Fiscal Year 1959*, September 30, 1954 map.

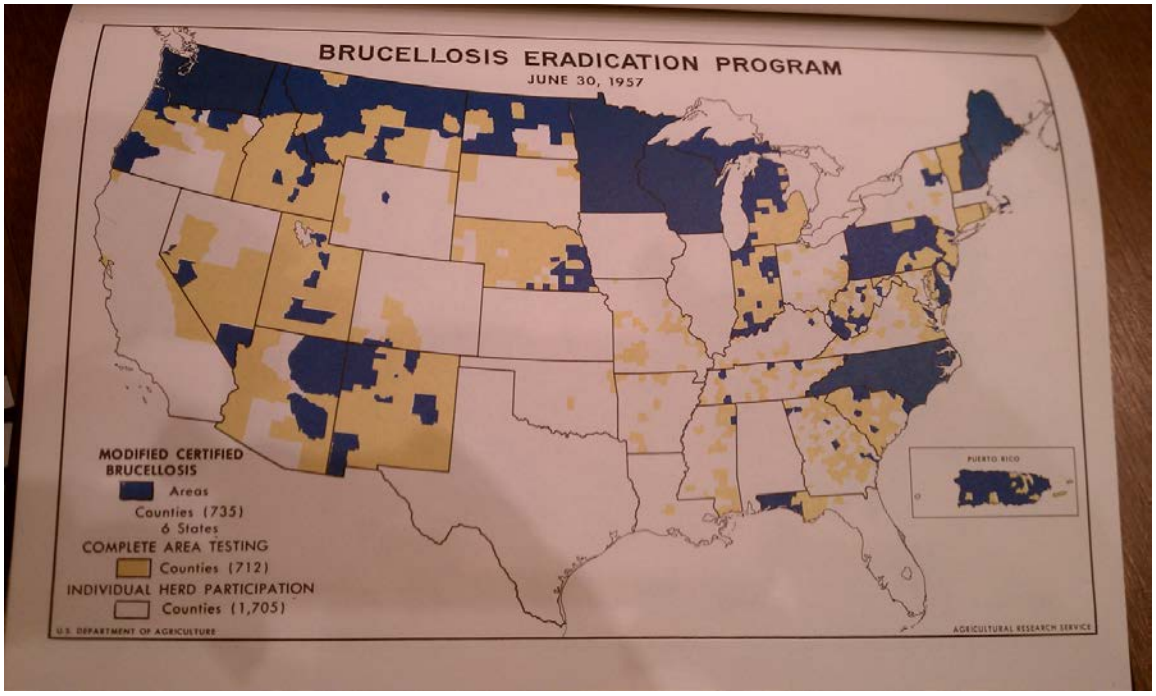

Image 5.2: Map of the Cooperative State-Federal Accelerated Brucellosis Eradication Program from June 30, 1957[43]

The map revealed a concentration of participating areas in states with active control programs that reached out to cattle owners to encourage participation in the program. The majority of the modified certified states were Northern dairy states such as Wisconsin, New Hampshire, and Pennsylvania and states that already mandated brucellosis eradication like North Carolina.[44] These states transferred state programs and accreditation to meet the state-federal cooperative program standards. While these states embraced the eradication program, other large cattle producing states such as California, Texas, and Florida saw few areas joining the state-federal cooperative. These states often had little industry or veterinary medicine support for the eradication program.[45] Instead, they advocated for voluntary participation and vaccination so inclusion of areas in these states grew slowly. In addition, some states and areas in them like Iowa and Louisiana experienced low participation because they lacked local

[43]United States Department of Agriculture, *Cooperative State Federal Brucellosis Eradication Program: Statistical Tables, Fiscal Year 1961* (Washington, D.C.: United States Department of Agriculture, 1961), June 30, 1957 map.

[44]North Carolina, a major hog production state, wanted to clear brucellosis infection from its cattle and hog herds. Swine brucellosis caused a greater rate of animal death and posed a larger threat to livestock producers and packers since the swine version of the bacteria was more contagious to humans.
Report of the Chief of the Bureau of Animal Industry Agricultural Research Administration (Washington, D.C.: United States Government Printing Office, 1948), 91.

[45]A.K. Kuttler, 5.
United States Department of Agriculture, *Highlights of the Accelerated Brucellosis Eradication Program*, 5.

disease control agencies to enforce state testing laws needed for certification.[46] The USDA recommended education to encourage participation and then, if necessary, legal action to compel enforcement of testing laws.[47] Education and developing positive public opinion for the program remained the Department of Agriculture's primary strategy to increase area involvement in the eradication program.

While the eradication effort grew slowly in some areas, mainly in range cattle states, overall, the brucellosis eradication program flourished in the late 1950s.

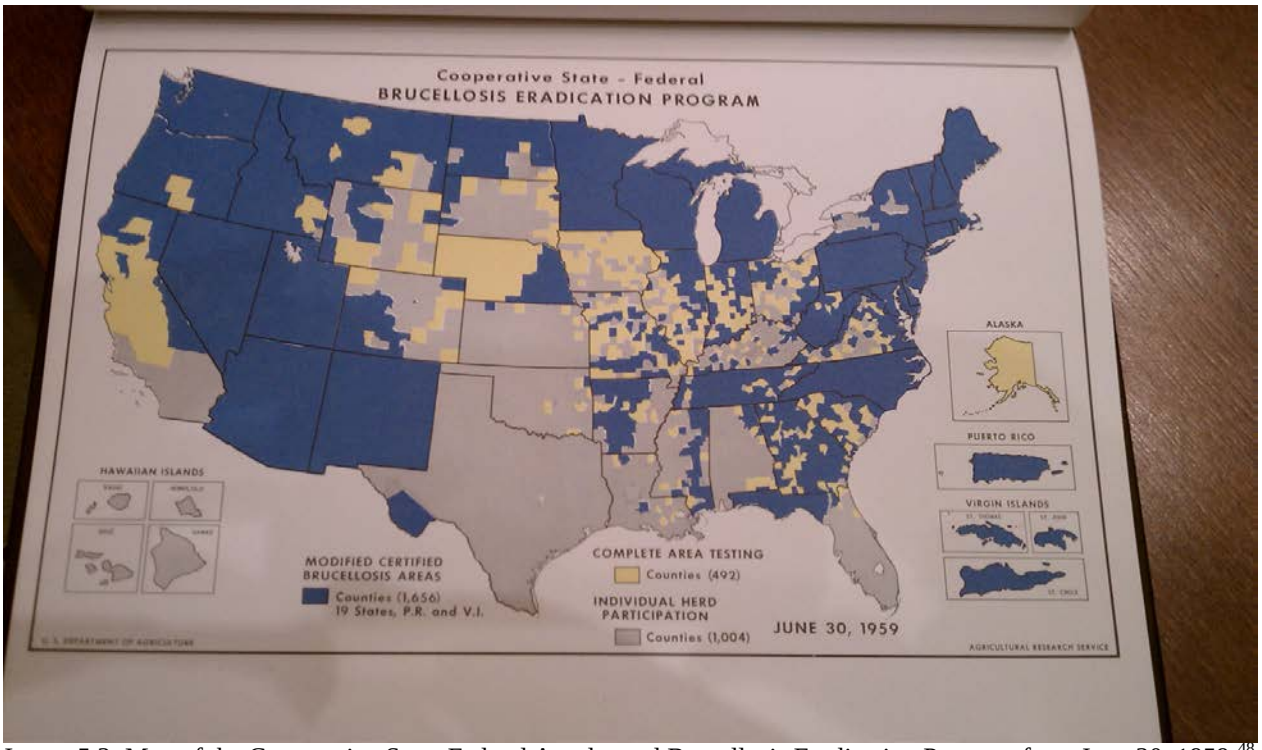

Image 5.3: Map of the Cooperative State-Federal Accelerated Brucellosis Eradication Program from June 30, 1959.[48]

By the end of the decade, each state had counties enrolled in the eradication program and 19 states and two territories held modified certified status. The program enjoyed increased success on all fronts as

[46]United States General Accounting Office, *Weaknesses in Animal Disease Control Activities Involving Primarily Eradication of Brucellosis in Cattle, Agricultural Research Service, Department of Agriculture; Report to the Congress of the United States* (Washington, D.C.: United States Government Printing Office, 1964), 9, 42.

[47]Ibid., 44.
Jessie Johnson v. Dave L. Pearce, 313 So 2nd, 812 (Supreme Court of Louisiana, 1975), http://scholar.google.com/scholar_case?case=16734847434430166202&hl=en&as_sdt=2,44 (accessed February 13, 2013).

[48]United States Department of Agriculture, *Cooperative State Federal Brucellosis Eradication Program: Statistical Tables, Fiscal Year 1959*, June 30, 1959.

brucellosis ring testing made monitoring certified herds in dairy areas easier, the percentage of eligible calves vaccinated increased each year, and many range cattle owners finally accepted the authority of local animal disease control officials to dictate eradication policy in areas in the program.[49] By the end of the 1950s, the Accelerated Brucellosis Eradication Program seemed to be on its way to accomplishing the goal of national eradication.

By 1960, the brucellosis eradication program had not achieved the Department of Agriculture's goal of a modified certified nation, but the program continued to get closer to that goal. New Hampshire became the first state to reach brucellosis-free status in 1960 and more states and areas followed.

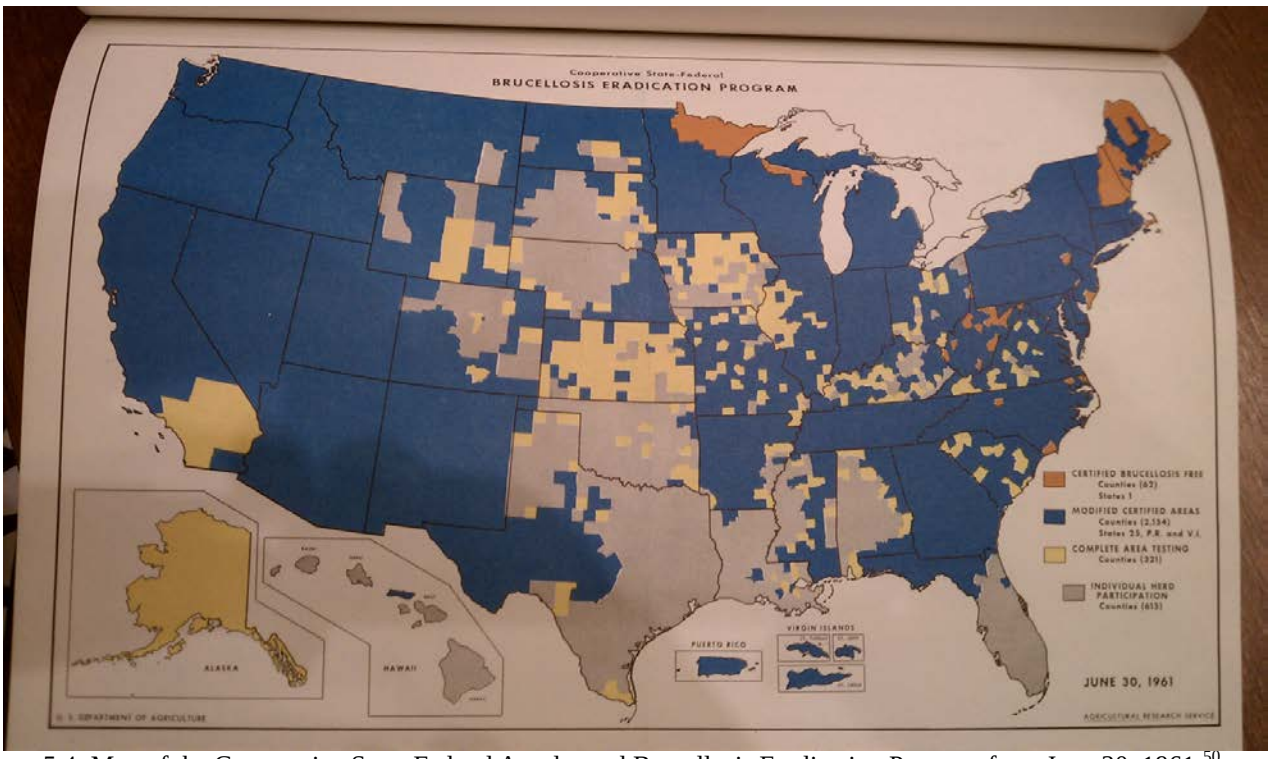

Image 5.4: Map of the Cooperative State-Federal Accelerated Brucellosis Eradication Program from June 30, 1961.[50]
By 1961, 2154 counties qualified for modified certified status expanding in areas that had previously

[49]"Editorial Comment – Let's Use the Milk Ring Test," *Hoard's Dairyman* 96, no. 23 (1951): 954.
United States Cooperative State-Federal Brucellosis Eradication Program, *Progress Report on Cooperative State-Federal Brucellosis Eradication Program, 1959, ARS 91-9*, 10.
"Resolutions Adopted at the 83rd Annual Convention," *The Cattleman* 46, no. 11 (1960): 19.
[50]United States Department of Agriculture, *Cooperative State Federal Brucellosis Eradication Program: Statistical Tables, Fiscal Year 1961*, June 30, 1961 map.

resisted eradication efforts. Parts of the Great Plains and the South lacked area participation, but 73% of counties in the United States obtained modified status.[51] As the state-federal cooperative plan grew, the economic threat of brucellosis shrank. The disease only cost the cattle industry an estimated $23 million dollars in loss in 1961 compared to the estimated $11.9 billion raised from cattle and dairy sales in 1959.[52] As the risk to the national economy decreased, groups promoting the program stopped using the economic impact of the disease on the total cattle economy as justification for the program.[53] Advocates of brucellosis control always used personal economics to justify eradication in a herd and in the 1960s, this became the main economic reason for participation in the state-federal program. Being able to transport cattle without testing, sell dairy products, and participate in the multibillion dollar cattle economy enticed many cattle owners to agree to join the program.

Market Cattle Testing and Cattle Identification

The growth of the Accelerated Brucellosis Program was also impacted by several new testing technologies and policies that made testing easier for range cattle owners leading to an increase in participation in those areas. In 1962, the USDA modified the UMR on the advice of the National Brucellosis Committee and the United States Livestock Sanitary Association to include market cattle identification testing (MCI).[54] Developed in late 1957 in Montana, the cattle testing program served as a compliment to brucellosis ring testing for meat cattle. Cattle 30 months or older received government

[51]C. K. Mingle, "The Cooperative State-Federal Brucellosis Eradication Program: A Program Report," *National Brucellosis Committee: 1965 Proceedings*, (Washington, D.C.: United States Department of Agriculture, 1965), 53.
[52]United States General Accounting Office, 2.
United States Census Office, *U.S. Census of Agriculture: 1959. Volume 2 Statistics by Subjects* (Washington, D.C.: United States Government Printing Office, 1960), 480-482.
[53]"A New Procedure for Screening Cows for Brucellosis and Tuberculosis," in *National Brucellosis Committee: 1965 Proceedings* 7 (Washington, D.C.: United States Department of Agriculture, 1965).
[54]Market cattle identification also served as a testing program for tuberculosis monitoring. Select carcasses were not only blood tested but also inspected for TB and then cases could be traced back to herds for more testing.
Barnes, 17.

supplied back tags when they arrived at packing plants for slaughter.[55] A certain percentage of cattle then underwent standard agglutination blood testing for brucellosis. The tags included information about the ownership of the animal so when an animal tested positive or suspicious, animal health officials traced the animal back to its herd and tested the entire herd. They also used information about negative tests to certify or recertify areas and states.[56] Just as the brucellosis ring test made monitoring for the disease in dairy herds less invasive and less expensive, MCI simplified the process of testing meat cattle with no expense or added labor for cattle owners and minimal inconvenience for stockyard works. The MCI system generally had the support of health officials, meat producers and stockyards because

> this program removes from the livestock owner the inconvenience and cost necessitated by the program of periodic testing. For the state regulatory agency it pinpoints with exactness the area of disease and thereby the opportunity to effect prompt eradication. For the public it is a tremendous step forward in the assurance of a healthy meat supply.[57]

Many of those involved in the brucellosis eradication effort believed that with the inclusion of MCI into the eradication program, the disease could truly be eradicated from all herds.

Market testing provided a method of easy monitoring for brucellosis, but the program had its problems. Since the program relied on testing only a portion of cattle entering the slaughterhouse, small herds often ended up not being tested because they sent so few animals to slaughter. Some states combated this problem by mandating the testing of all cattle at slaughter and all cows and heifers at the point of entry into the market including cattle auctions.[58] This system called market cattle testing (MCT)

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[55]Raymond A. Dietrich, Stephen Harold Amosson, and Richard P. Crawford, *Economic and Epidemiologic Analysis of U.S. Bovine Brucellosis Programs* (College Station, TX: Department of Agricultural Economics, Texas Agricultural Experiment Station, Texas A & M University System, 1986): 5.
[56]"A New Procedure for Screening Cows for Brucellosis and Tuberculosis," 5.
[57]Ibid., 7.
[58]Dietrich, Amosson, Crawford, 5.

provided more comprehensive testing of cattle not covered under the BRT system. By testing all animals or earlier in the cattle sale process, advocates hoped to speed up the process of national eradication.[59] Even with increased testing, the market cattle identification program still missed diseased cattle and herds. Some cattle owners never sold their cattle through auctions, slaughterhouses, or other market channels so their cattle never underwent testing. When diseased animals were detected through MCI or MCT, animal health officials used the owner information on the back tag to trace the animal to its original owner. They relied on that owner to inform them what herd the animal came from for full herd blood testing. Some owners maintained multiple herds and lied to state officials so that infected herds avoided quarantine.[60] In other cases, the ownership of the animal changed so many times that tracing its origin became impossible.[61] Bad record keeping, multiple transactions, and deceptive practices prevented the market agglutination testing program from being fully effective as a monitoring program for brucellosis eradication. The monitoring of meat cattle differed from dairy cattle. For the BRT, a sample of milk from the whole herd underwent testing rather than samples from individual animals. Animal health officials did not have to trace the origin herd, since that was the sample unit, so positive or suspicious BRT testing almost always resulted in followup testing for the herd. MCI or MCT still relied on individual animals as the unit of testing and needed to be able to follow the sales path of that animal to test its original herd.

The USDA recognized that "the key to a successful MCT program is, of course, animal identification."[62] Animal health officials had to know the brucellosis status of the animal and where it came from in order to run the MCI or MCT program. In order to make the market testing program more effective, the Department of Agriculture proposed a National Interstate Identification Program that

[59]"The National Brucellosis Program of the United States," in *Bovine Brucellosis: An International Symposium*, ed. Richard P. Crawford, and Richard J. Hidalgo (College Station, TX: Texas A&M University Press, 1977), 406.
[60]Ibid., 406.
[61]United States Agricultural Research Service, *Cooperative State-Federal Brucellosis Eradication Program: Progress Report, Calendar Year 1965* (Hyattsville, MD: United States Government Printing Office, 1966), 5-6.
[62]Ibid., 5.

would require cattle owners to tag every animal. They argued that this program made brucellosis testing more effective since it simplified record keeping and allowed an animal to be tracked every step of the way from birth to slaughterhouse. The tag went beyond the existing system of branding reactors and tattooing vaccinates since the national ID plan would track the movement, sale, and testing history of each animal. Many range cattle owners rejected a national plan even though they supported MCT and back tagging as a method of brucellosis certification. They saw MCT as a cheap and efficient way to achieve certification since it placed little burden on cattle owners while a national identification program resulted in great expense and inconvenience for a cattle owner.[63] While market identification served a purpose of controlling brucellosis and the cost fell to the state-federal cooperative program, a full coverage identification program represented government interference and shifted the burden of cost to the cattle owner.

The call for cattle identification to improve the MCT plan tied an animal's brucellosis status even closer to its identity. As discussed earlier in the chapter, the status of an animal related to the status of its herd, area, and state. Modified certified or brucellosis-free status for an area or state made movement of animals easier for cattle owners leading to an economic benefit of having disease free animals. The reactor status of an animal acted as a de facto passport, allowing non-reactors to travel interstate or intrastate without extra precautions and testing. With a national ID system for cattle, the health status of an animal would become an actual passport for transportation along with serving as a method of brucellosis monitoring. Each animal would be identified as from a modified certified herd, a brucellosis-free herd, a quarantined herd, or a nonparticipating herd. Those from approved herds could travel freely while those from nonparticipating herds or herds with brucellosis would require additional testing and quarantine if sold interstate. The identity of the animal and its value for sale directly related

[63]"Resolutions Adopted at the 87th Texas and Southwestern Cattle Raisers Association Convention," *The Cattleman* 50, no. 11 (1964): 27.

to the status of its herd and its own status since diseased animals had to be sent to slaughter.[64] The brucellosis status of an animal became its identity in the herd and in the marketplace under a national identification program.

The Accelerated Brucellosis Eradication Program in the Mid-1960s

The development of market cattle testing and the movement to national identification of cattle came at a time when the Accelerated Brucellosis Eradication Program shifted its policy to support eradication rather than control of the disease. The goal of the program had always been eradication, not control, and by the mid-1960s, this seemed possible.[65] Even with its identification problems, the MCT created an effective method of controlling brucellosis in meat cattle including range cattle. As a result, the USDA eliminated multiple plans as part of the Uniform Methods and Rules in July 1964. Herds in the brucellosis eradication program had to be blood tested and the reactors promptly disposed of by slaughter. Vaccination of calves remained optional under the plan and vaccination alone was no longer accepted as an eradication plan.[66] Range and semi-range areas still needed to test a portion of cattle in an area to achieve modified certified status, but the required number of cattle to be tested increased.[67] The special provisions provided for range cattle owners to gain their support for the program began to disappear as more counties eradicated brucellosis including those in range cattle areas.

By the end of 1965, 87% of counties in the United States obtained either modified certified or brucellosis-free status.[68] The eradication program used BRT, MCT, and herd blood testing along with public health measures such as employing epidemiologists to trace the origins of infection in an area,

[64]United States Department of Agriculture Agricultural Research Service, *UMR*, 1967, 8-12, 17-25.
[65]Barnes, 21.
[66]United States Department of Agriculture Agricultural Research Service, *UMR*, 1963, 4.
[67]Ibid., 12.
[68]C. K. Mingle, 53.

quarantine, and sanitation measures to eradicate the disease from an area.[69] Six states, one territory, and another 499 counties in twenty-seven states eliminated brucellosis and another 2,256 counties maintained modified certified status.[70]

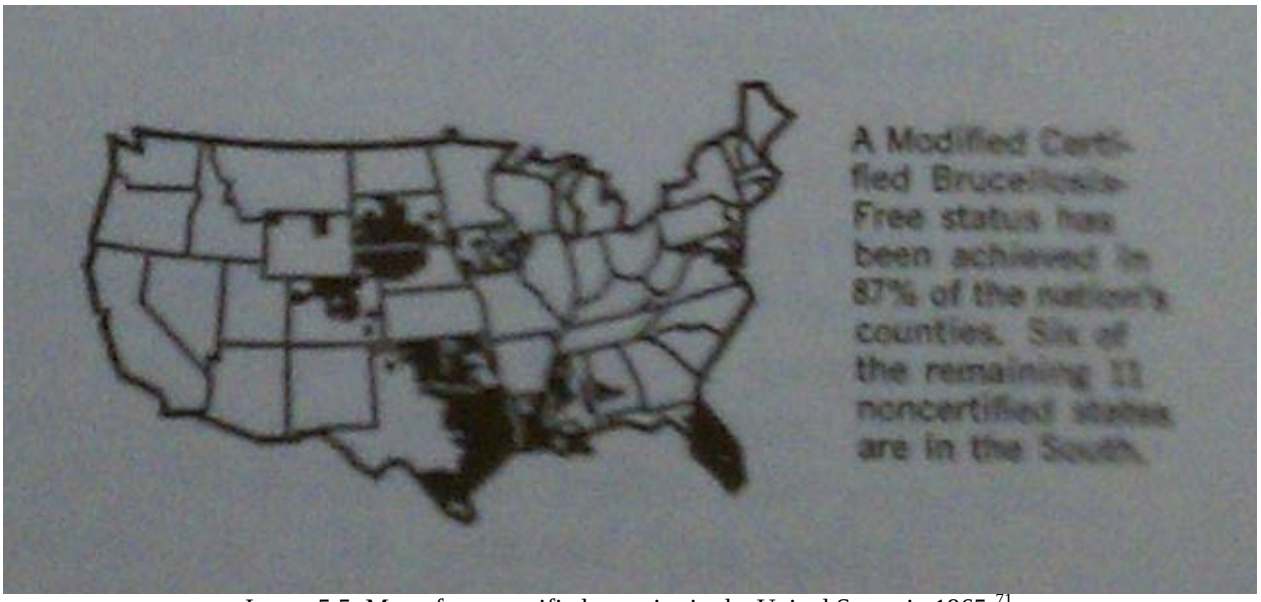

Image 5.5: Map of non-certified counties in the United States in 1965.[71]

The largest concentrations of non-certified areas existed in East Texas, Louisiana, Oklahoma, and the Florida peninsula along with clusters of areas in the South and Great Plains. The program operated as an industry-state-federal cooperative and expanded based on the success of inducing the support of cattle owners. Many of these areas had resisted the program initially and the local cattle industry only slowly signed up to have their herds tested. In Florida, violent opposition shut down the brucellosis eradication program in 1959 and testing only restarted in one county in 1965. The USLSA worked with interested local cattle owners and agricultural press to expand the program across the state and catch Florida up to progress made in other states.[72] With every state participating in the state-federal program

[69]Ibid., 24.
[70]"U.S. Brucellosis Eradication Well Under Way," *The Cattleman* 52, no. 7 (1965): 110.
[71]Pete Head, "Sales Restrictions Proposed as a New Step in Brucellosis Eradication," Reprinted from March 1966 issue of *Progressive Farmer*, Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings February 1966 – December 22, 1967, Dolph Briscoe Center for American History, University of Texas at Austin.
[72]United States Agricultural Research Service, *Cooperative State-Federal Brucellosis Eradication Program: Progress Report, Calendar Year 1965*, 30.

again, the USDA aimed to eradicate bovine brucellosis in 1972 by eliminating all certification plans except test-and-slaughter, expanding MCT, and refining the interpretation of BRT results to reduce the number of suspicious results.[73]

Vaccination and Its Role in Eradication of Brucellosis

State and federal brucellosis eradication committees and groups continued to encourage education and awareness of the program and the impact of the disease on cattle in order to gain the support and cooperation of the remaining non-participating cattle owners.[74] In these areas, program advocates continued to promote use of the vaccine, but in modified certified areas and certified-free areas, they deemphasized the use of the vaccine.[75] Vaccinated cattle proved to be a liability since a certain percentage continued to test as reactors for the agglutination test, and studies showed that some became carriers that could infect susceptible animals.[76] The national brucellosis committees advised the discontinuation of vaccine use in low prevalence areas in 1965 and change of state laws to remove statutes requiring that all imported cattle be vaccinated.[77] Vaccination remained a tool of eradication in limited situations due to the complications associated with testing.[78]

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[73]Mingle, 46-48.
[74]Steele, 37.
[75]United States Agricultural Research Service, *Cooperative State-Federal Brucellosis Eradication Program: Progress Report, Calendar Year 1965*, 6.
[76]Mingle, 49.
[77]Ibid., 59
E.A. Schiff, "The Cooperative State-Federal Brucellosis Eradication Program," in *National Brucellosis Committee: 1966 Proceedings* 24 (Washington, D.C.: United States Department of Agriculture, 1966).
[78]The National Brucellosis Committee advocated for more research into brucellosis including better ways to detect antigens, use existing testing, and more information on the efficiency of the vaccine in calves under four months. This information could then be used to improve the eradication program and allow for expanded use of the vaccine. No major research projects on brucellosis existed on the federal, state, or private level since the start of the eradication program. Some veterinary medical researchers investigated the use of the European equivalent of strain 19 vaccine, 45/20, or worked on improving antigens for testing, but these were not major research projects. The last major project had been the development of the M vaccine in the 1940s which turned out to be less effective than the strain 19 vaccine and therefore abandoned as a possible bovine or human vaccine.
C.A. Manthei, "An Appraisal of Brucellosis Eradication Goals and Current Research," in *National Brucellosis Committee: 1965 Proceedings* 25-26 (Washington, D.C.: United States Department of Agriculture, 1965).
"An Investigation and Evaluation of the Brucellosis Eradication Program in the State of Texas," *The Cattleman* 55, no. 11

As the prevalence of bovine brucellosis decreased, swine brucellosis rose in importance in the brucellosis eradication program. The original eradication program included coverage of both swine and goat brucellosis, but left regulations to areas with larger concentrations of those animals.[79] The 1963 version of the UMR included regulations for eradicating the disease in hogs and by 1965, the prevalence of the swine disease dropped to 3.2% as states began to be certified as free of hog brucellosis.[80] Regulations on imported pork created by other nations in the early 1960s increased the need to eradicate the *Brucella suis* version of the disease as did the changing epidemiology of undulant fever.[81] Of the 405 cases of human brucellosis reported in 1964, approximately half of them traced back to infection from swine, mainly in packinghouse workers.[82] Eradication of animal reservoirs remained the most effective way to eradicate the disease in humans, but the target reservoir shifted from cattle to swine. The Accelerated Brucellosis Eradication Program still focused the bulk of its time, effort, and money on cattle, but with the bovine form of the disease on the decline, swine brucellosis became a more prominent target leading to shifting in some funds and focus in pursuit of eradicating all

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(1969): 118-120.

[79]Texas and New Mexico experienced a large outbreak of *Brucellosis melitensis* in the late 1960s, but usually the prevalence of brucellosis in goats remained low. The federal eradication program responded to the southwest outbreak and used it as a learning opportunity to study the most effective way to contain the goat disease that created problems internationally. The United States government and university researchers often participated in international seminars and research into goat brucellosis including vaccine development, epidemiological studies, and control measures.
H. G. Wixom, "Report of the United States Animal Health Association Committee on the Cooperative State-Federal Brucellosis Eradication Program," in *1970 Proceedings of the National Brucellosis Committee of Livestock Conservation, Inc., and Progress Report of the Cooperative State-Federal Brucellosis Eradication Program* 42 (Washington, D.C.: United States Department of Agriculture, 1970).
United States Agricultural Research Service, *Cooperative State-Federal Brucellosis Eradication Program: Progress Report, Calendar Year 1965*, 15.
Central Treaty Organization Economic Committee Sub-committee on Agriculture, Animal, Production, and Animal Health, *Report of the Seminar on Brucellosis Held at the Institute of Bacteriology and Serology, Istanbul, June 20-29, 1960*, RG0469, Entry P109, Container 12, AGRI – Reports: Seminar on Brucellosis, 1960, United States National Archives.

[80]United States Department of Agriculture Agricultural Research Service, *UMR*, 1963, 28-36.
United States Agricultural Research Service, *Cooperative State-Federal Brucellosis Eradication Program: Progress Report, Calendar Year 1965*, 14.

[81]United States Agricultural Research Service, *Cooperative State-Federal Brucellosis Eradication Program: Progress Report, Calendar Year 1965*, 6.

[82]Steele, 27.

brucellosis by 1975.[83]

As the prevalence of bovine brucellosis infection declined and the amount of testing, vaccination, and other eradication methods associated with the state-federal program increased, budgets had to stretch farther.[84] The National Brucellosis Committee recommended using methods developed by research and proven to work efficiently like BRT and MCT, reevaluating programs in non-certified states, and redirecting funds to effective programs in need of more support.[85] They also requested more funds for late 1960s to meet the needs of areas that had not eradicated brucellosis.[86] Instead, the federal government curtailed funding for fiscal year 1968 and mandated that states cover at least 40% of the cost of brucellosis eradication.[87] The success of the program worked against it for funding. As the number of cases of brucellosis decreased and most counties gained certified status, the less urgent the need for eradication and funding for the program seemed to Congress who allocated funds for the Department of Agriculture and its programs. In order to conserve funds and direct them to non-certified states, the federal government stopped funding for vaccination in all brucellosis-free states and most

[83]The Accelerated Brucellosis Program included swine and goats, but the USLSA and the NBC also advocated expanded the eradication program to include bison since they also served as a reservoir of *Brucella abortus.* In order to truly eradicate the disease it had to be eradicated in all species and in all areas so they wanted they program to extend to all cattle and bison on American Indian reservations and federal land including the buffalo herds at Yellowstone National Park.
Wixom, "Report of the United States Animal Health Association Committee on the Cooperative State-Federal Brucellosis Eradication Program," 1970, 42.
"Recommendations of the National Brucellosis Committee," in *National Brucellosis Committee: 1967 Proceedings*, (Washington, D.C.: United States Department of Agriculture, 1967), 51.
W.T. Berry, Bob Laramore, and J.O. Pearce Jr. to American National Cattlemen's Association State Presidents and Secretaries of Brucellosis and Anaplasmosis Committees, November 8, 1966, Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings February 1966 – December 22, 1967, Dolph Briscoe Center for American History, University of Texas at Austin.

[84]The annual federal brucellosis control budget was around $20 million and states contributed about $20 million though some states provided more funding than others.
Minutes of the Meeting of the Animal Health Committee, Wichita Falls 6-17-66, 9, Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings February 1966 – December 22, 1967, Dolph Briscoe Center for American History, University of Texas at Austin.

[85]A. O. Wilson, "Proposal by the U.S. Livestock Sanitary Association on Brucellosis Eradication," in *National Brucellosis Committee: 1966 Proceedings* 39 (Washington, D.C.: United States Department of Agriculture, 1966).

[86]S. H. McNutt, "Recommendations of the National Brucellosis Committee," *National Brucellosis Committee: 1966 Proceedings* 43 (Washington, D.C.: United States Department of Agriculture, 1966).

[87]Frank A. Hudson, and Dale W. Zinn, *An Investigation and Evaluation of the Brucellosis Eradication Program in the State of Texas: Final Report* (Lubbock, TX: Texas Technological College, 1969), Appendix-2.

modified certified areas in December 1967.[88] Previously, the state-federal program deemphasized the use of vaccination in these areas for logistical reasons, but with shrinking federal funds, the decision to stop funding was a financial one. Many cattle owners in these areas opposed the cuts because they viewed the vaccine as one of the successful tools of eradication even though it led to some permanent reactors and incomplete immunity in some cattle.[89] States and cattle owners continued to cover the cost of vaccination in many of these areas and in 1968, the highest rates of vaccination occurred in brucellosis-free states. Both New York and Connecticut, disease-free states, vaccinated over 70% of eligible calves while Texas and Oklahoma vaccinated less than 20% of the eligible calves in the state.[90] While the federal committees urged a decreased use of the vaccine in certified areas, most cattle owners in certified areas still thought the advantages outweighed the problems associated with the live strain vaccine. Many states and local eradication programs responded to local industry concern about dropping calfhood vaccination by continuing to allow and cover the cost of vaccination.[91] Cutting off funding did little to alter the desire of cattle owners to vaccinate their calves in certain certified areas like Wisconsin and New York.

New Methods of Expanding Testing and Identification

The focus on vaccinations and funding was not the only step the National Brucellosis Committee and the United States Livestock Sanitary Association recommended to encourage

[88]W.C. Ray, "The Cooperative State-Federal Brucellosis Eradication Program, A Program Report," in *Proceedings of the National Brucellosis Committee and Progress Report of the Cooperative State-Federal Brucellosis Eradication Program* 10 (Hyattsville, MD: United States Department of Agriculture, 1968).
"Bang's Vaccination Cost Shared by Wisconsin," *Hoard's Dairyman* 114, no. 19 (1969): 1129.

[89]"Wisconsin Ends Payment for Bang's Vaccinations," Hoard's *Dairyman* 115, no. 14 (1970): 989.
House Committee on Agriculture, *Brucellosis Eradication Program: Hearing Before the Subcommittee on Department Operations, Investigation, and Oversight*, 94th Cong., 2nd Sess., June 28, 29, 30, 1976, 117.
House Committee on Agriculture, Brucellosis Outbreak in New York and Vermont: Hearing Before the Subcommittee on Department Investigations, Oversight, and Research, 95th Cong., 1st sess., September 30, 177 and October 1, 1977, 12, 28.

[90]H. C. King, "The Cooperative State-Federal Brucellosis Eradication Program, A Program Report," in *1969 Proceedings of the National Brucellosis Committee of Livestock Conservation, Inc., and Progress Report of the Cooperative State-Federal Brucellosis Eradication Program* 10 (Washington, D.C.: United States Department of Agriculture, 1969).

[91]Ibid., 10

compliance with the program in non-certified areas. They also adopted card testing as a valid method of agglutination testing and advocated for more complete cattle identification recommending the Department of Agriculture enact both as part of the Uniform Methods and Rules. The card test utilized the same science as the tube agglutination test but instead of being conducted in a lab, card testing occurred in the field. Unlike the tube test, the card test led to a definitive result of negative or reactor, allowing for reactor cattle to be immediately quarantined for further testing or slaughter. Cattle owners and veterinary medicine practitioners saw the test as particularly useful for range cattle owners since it caused less disruption to the cattle raising cycle and yielded quick initial results.[92] In the 1967 UMR revisions, card testing gained equal status as tube testing for certification.[93] The card test had the same accuracy as other agglutination testing but provided a quicker, more efficient method of testing a herd that tested positive through monitoring testing or routine certification under the brucellosis eradication program.

Along with accepting card testing, the National Brucellosis Committee and USLSA requested that the state-federal eradication program require that all cattle, except steers and spayed heifers, over the age of two be back tagged at the first point of concentration when heading to slaughter.[94] With 40% of these animals moving across state lines, this regulation would ensure that diseased cattle would be traced back to their original herd and solve some of the problems associated with market cattle testing.

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[92]"New Brucellosis Test," *The Cattleman* 52, no. 11 (1966): 28.
R. J. Anderson to Dolph Briscoe, June 14, 1966, Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings February 1966 – December 22, 1967, Dolph Briscoe Center for American History, University of Texas at Austin.

[93]United States Department of Agriculture Agricultural Research Service, *UMR*, 1967, 20.
W.T. Berry, Bob Laramore, and J.O. Pearce Jr. to American National Cattlemen's Association State Presidents and Secretaries of Brucellosis and Anaplasmosis Committees, November 8, 1966.
American National Cattlemen's Association, *Animal Health Committee Report, January 11, 1967, Colorado Springs, CO.*, Texas and Southwestern Cattle Raisers Association Records, Box 3E107, Folder – Conventions and Executive Meetings, March 2, 1966 – August 3, 1968, Dolph Briscoe Center for American History, University of Texas at Austin.

[94]John L. Wilbur to Ben H. Carpenter, March 7, 1967, Texas and Southwestern Cattle Raisers Association Records, Box 3E107, Folder – Conventions and Executive Meetings, March 2, 1966 – August 3, 1968, Dolph Briscoe Center for American History, University of Texas at Austin.

Back tags also served as identification for animals in need of shipping permits.[95] By tagging cattle earlier, epidemiologists working for the eradication program could rapidly track cattle back to their herd and eliminate that source of the infection.[96] Some states had already instituted point of concentration tagging but incorporating it into the UMR guaranteed that all states adopted this practice. Unlike the earlier national cattle identification plan, the back tag program enjoyed wide industry support since it required no extra work or financial burden for cattle owners and only impacted cattle who already received back tags through MCT instead of all cattle. In 1969, the USDA adopted the point of concentration tagging program and looked to further expand market testing.[97] While many states participated in MCT and it served as a method of monitoring certified herds, not all states had adequate market cattle testing programs.[98] Back tagging most cattle served no purpose if the cattle in question never entered into a testing system.

Interstate Transportation Regulations

Both card testing and point of concentration tagging had the support of most of the cattle industry, veterinary medical officials, and various brucellosis committees. Not all of the changes proposed to the UMR that had been suggested by the USLSA and the NBC had such broad support. In order to achieve the goal of brucellosis eradication, the United States Livestock Sanitary Association and the National Brucellosis Committee proposed changes to the Uniform Methods and Rules and

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[95]"Proposed and New Federal Regulations," in *1969 Proceedings of the National Brucellosis Committee of Livestock Conservation, Inc., and Progress Report of the Cooperative State-Federal Brucellosis Eradication Program* 49 (Washington, D.C.: United States Department of Agriculture, 1969).

[96]F. W. Hansen, "The Animal Identification Regulation," in *Proceedings of the National Brucellosis Committee and Progress Report of the Cooperative State-Federal Brucellosis Eradication Program* 33 (Hyattsville, MD: United States Department of Agriculture, 1968).

[97]Wixom, "Report of the United States Animal Health Association Committee on the Cooperative State-Federal Brucellosis Eradication Program," 1970, 41.
Barnes, 17.
"Proposed and New Federal Regulations," 49.

[98]Barnes, 17.
"41 States Using MCT Effectively to Eradicate Brucellosis" *The Cattleman* 54, no. 12 (1968): 33.

federal cattle transport laws to ensure that all areas entered their state brucellosis eradication programs. In a meeting in late 1965, the USLSA urged the USDA and states to modify the UMR and their shipping laws to allow for unrestricted movement for cattle to and from certified areas.[99] This request shifted the unit of certification needed for free movement of cattle by basing the need for testing on area brucellosis status rather than on herd status. Under this proposed new interstate transportation regulations, all cattle from non-certified areas faced testing thirty days before transportation, quarantine upon arrival, and further testing at least thirty days after sale unless they went to an approved slaughterer or feedlot.[100] This went beyond the existing regulations for testing of non-certified cattle, which allowed for testing any time before transportation including the day of movement. The requirement of blood testing and quarantining an animal for at least a month made cattle from non-certified areas less desirable for cattle owners from certified areas who wanted to purchase breeding cattle, replacement cattle, or dairy cattle. The USLSA hoped not only that the policy would prevent the spread of the disease back into certified areas, but that the economic disadvantage of being a non-certified area would encourage cattle owners to enroll in the eradication program. The policy was set to start in 1968 when the USDA estimated that the only remaining non-certified states would be Texas, Florida, and Wyoming.[101]

[99]Wilson, 41.
Head.
[100]"Brucellosis Problems Vary," *The Cattleman* 54, no. 10 (1968): 114.
[101]Head.

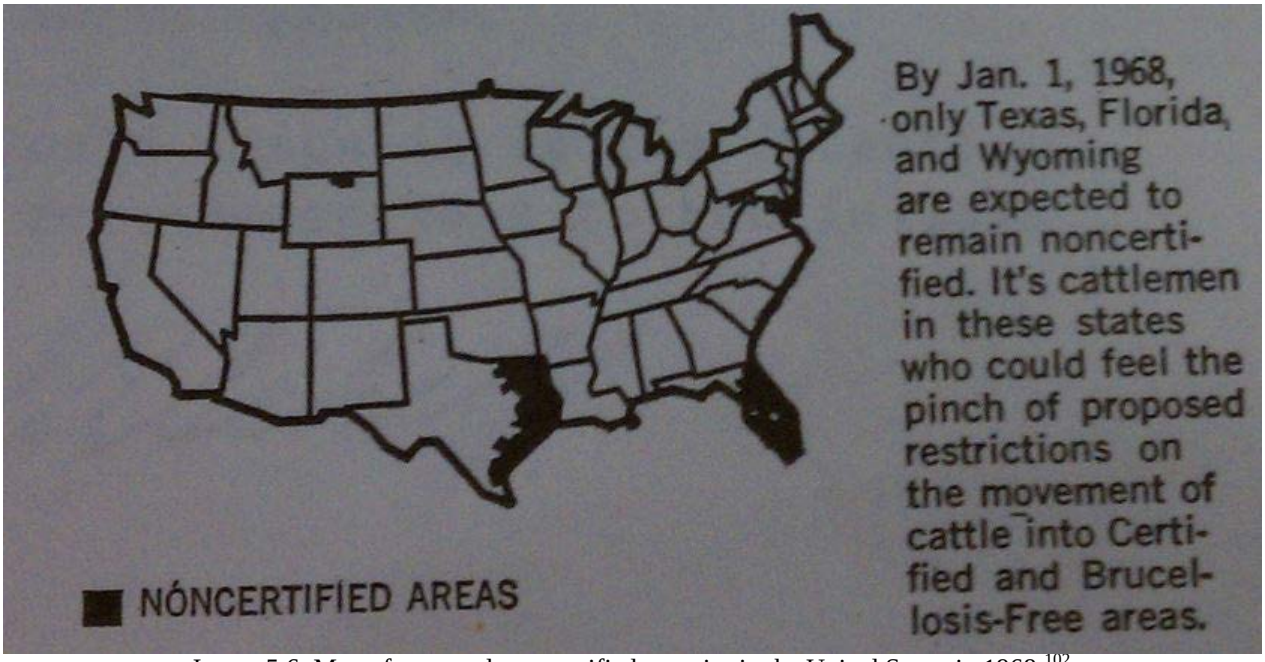

Image 5.6: Map of expected non-certified counties in the United States in 1968.[102]

The expected non-certified areas in the Eastern part of Texas, the Florida peninsula, and North Central Wyoming faced potentially shrinking markets for easy cattle transportation. This would impact area cattle owners' ability to participate in the lucrative cattle sales market worth over $8 billion in 1964.[103] Even if producers did not think that brucellosis posed a problem in their cattle, it became a problem if all other areas cleaned up and they did not.[104] The proposed cattle movement restrictions essentially forced large cattle producers "to participate whether they liked it or not," due to the potential economic consequences of being in a non-certified area.[105] This policy change amounted to a quarantine of these areas without officially calling the changes a quarantine. The Department of Agriculture had used quarantines since its first animal disease control effort to prevent the spread of infection, and it also utilized them to encourage participation in eradication programs due to the economic impact of

[102]Ibid.
[103]United States Bureau of the Census, *United States Census of Agriculture, 1964* (Washington, D.C.: United States Government Printing Office, 1967), 58, http://usda.mannlib.cornell.edu/usda/AgCensusImages/1964/02/02/743/Table-05.pdf (accessed February 10, 2013).
[104] C.G. Scruggs to Dolph Briscoe Jr., June 2 1966, Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings February 1966 – December 22, 1967, Dolph Briscoe Center for American History, University of Texas at Austin.
[105]James E. Vance, "County Cattleman Plan New Fight on Disease," *Fort Worth Star Telegram*, June 1, 1966, Wednesday morning edition.

quarantines. The proposed change would not officially ban the transport of cattle from non-certified areas like a USDA quarantine, but it would make the purchase of cattle from these areas so undesirable that it would serve the same purpose. Local brucellosis eradication committees and agriculture publications urged cattle owners in these areas to achieve at least modified certified status so they could continue to engage in unrestricted interstate and intrastate cattle sales.

The proposed changes in transportation in the UMR impacted the relationship of an animal's brucellosis status and the status of its herd and area. With the new regulation, all cattle in a certified-free or modified certified area assumed the health status of the entire area. Their health no longer depended on their individual reactor status derived from a test before transportation but rather the status of a whole area or state. However the status of an area still relied on herd certification that required individual blood testing of each animal. Every animal had to be blood tested at some point and the certification status of a herd derived from that, but uncoupling transportation of an animal from direct agglutination testing changed the impact of having area certification. If a cattle owner with a certified herd operated in a non-certified area, his or her cows became uncertified in the eyes of the proposed transportation law and they had to undergo the same testing as cattle from non-certified herds. The health of the individual animal still mattered for the actual test itself, and brucellosis-free cattle could ultimately still move to certified areas, but certified herds would face the same economic troubles as the non-certified herds in these areas since they had to undergo testing and quarantine. According to federal and state law, the actual disease status of an individual animal at the time of transportation held less importance than the status of the area they moved to and from. The changes to the UMR would confer a negative status to any diseased cattle in certified areas since they no longer had to be tested and would apply an assumed reactor status on non-diseased cattle in non-certified areas until testing proved otherwise.

The focus on participation and eradication in non-certified areas shifted rhetoric that supported

the state-federal program. The justification of economics and public health remained the same as before, but a discussion of how to achieve the end goal of eradication emerged. Advocates of the program wrote about the need to eliminate the last pockets of infection and prevent reinfection of certified areas. The rhetoric for the brucellosis eradication program tended to split based on the certification status of the area it targeted. On the federal level, the National Brucellosis Committee called on state committees and cattle owners to avoid complacency or procrastination in eradication and to make the most of the limited federal funds to run an effective program.[106] States with certified status faced the problem of complacency while non-certified spaces encountered the problem of lack of participation or procrastination among cattle owners in entering the program. This rhetoric filtered down to the state and local level based on certification status. In states with certified-free status, animal health officials reminded cattle owners that the disease could reappear in the state and that "we must not relinquish our determination to wipe out completely, and as quickly as possible, this economic and public health problem."[107] Cattle owners and state programs had to continue herd management, sanitary standards, and testing to prevent reinfection and the loss certified status. For non-certified areas, advocates of the program argued that "we have a mission as yet unperformed," as they tried to rally enough signatures to enter areas into the state programs.[108] They placed the responsibility for national eradication at the feet of nonparticipating cattle owners since "as long as some cattlemen continue to drag their feet, the day for rejoicing will remain in the distant future."[109] For these individuals, participation in the program and achieving certified status needed to be accomplished not just for economic reasons but also to prevent the reinfection of cattle in certified areas and to achieve nationally eradication.[110] Entering the brucellosis eradication program became a mission cattle owners had to accomplish for economic and

[106]Ray, 1.
[107]"Editorial Comment – Disease Cleanup Continues," 386.
[108]Vance.
[109]Head.
[110]Ibid.

animal public health reasons. Unlike cattle owners in certified areas who just had to continue on the same path as before, cattle owners in non-certified areas had to take action.

The proposal to restrict cattle transportation divided cattle owners in range areas and states. Many supported the changes to the UMR because it forced areas to comply with certification standards.[111] In mixed dairy and range counties like Tarrant County (the second largest dairy producing county in Texas and home of the Fort Worth stockyards), dairy cattle herds entered the state-federal eradication program in the 1950s and achieved modified certified or brucellosis-free status but did not have the numbers to force the remaining cattle owners in the county into the program.[112] The changes in movement legislation allowed them to argue for full county participation, protecting their herds from reinfection and themselves from the economic impact of the policy. Some range cattle owners supported the policy because their herds, areas, and states achieved modified or certified-free status. Cattle owners across the west, from predominately beef or range cattle areas, controlled or eradicated the disease under the state-federal cooperative.[113] These range cattle owners may have protested the original creation of the program, but even states with initial problems with the eradication program and relatively low participation like Texas and Florida had half of their counties certified.[114] Many range cattle owners accepted the program and benefited from the proposed changes since they had certified herds.

While some range cattle owners had shifted their opinion on the brucellosis eradication program, many range cattle owners opposed the change in interstate cattle restrictions and the change in rhetoric that laid the blame for the lack of eradication on them. Many of these people expressed a problem with

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[111]Ibid.
Vance.
[112]Vance.
[113]United States Agricultural Research Service, *Cooperative State-Federal Brucellosis Eradication Program: Progress Report, Calendar Year 1965*. (Hyattsville, MD: United States Government Printing Office, 1966), 64.
[114]Ibid., 30, 64.

the attitude of eradication program officials and cattle owners from certified states and areas.[115] They felt the NBC and other program advocates unfairly laid the blame for brucellosis infection on non-certified areas when certified areas still had cases of brucellosis.[116] Modified certified areas only had to have less than five percent of herds with infection and an infection rate less than one percent. Even certified-free areas could contain infected herds as long as they remained less than one percent of the total number of herds and only two tenths of one percent of all cattle in the area tested positive for the disease. Even with BRT and MCT to provide continued monitoring, brucellosis could still exist or reemerge in these relatively disease-free areas. Many cattle owners in non-certified areas protested that their animals had to be tested to be moved while animals from certified areas moved without restriction even though they might also be infected.[117] They felt that the proposed changes to the UMR put unfair economic burden on non-certified cattle herd owners and placed too many restrictions on the movement of cattle.[118] Major meat producer associations and livestock market association spoke out against the proposed changes to the UMR and federal interstate transportation laws too.[119] These organizations also worried about the restriction of cattle movement and the financial burden it would place on cattle owners who had to pay to test cattle of all ages and genders before and after moving

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[115]Fred Wulf to Mr. George B. Doshler, February 18, 1966, Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings February 1966 – December 22, 1967, Dolph Briscoe Center for American History, University of Texas at Austin.

[116]*Minutes of the Meeting of the Animal Health Committee, Wichita Falls 6-17-66*, 8-9.

[117]A. M. Pickard, "Brucellosis Eradication Versus Control," *The Cattleman* 52, no. 8, (1966): 16.
American National Cattlemen's Association, *Brucellosis Committee Report, January 22, 1968, Oklahoma City, OK.*, 2, Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings January 12 – September 20, 1968, Dolph Briscoe Center for American History, University of Texas at Austin.

[118]C. W. McMillan to E. E. Saulmon, March 15, 1968, Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings January 12 – September 20, 1968, Dolph Briscoe Center for American History, University of Texas at Austin.
"Resolution, March 11, 1968," Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings January 12 – September 20, 1968, Dolph Briscoe Center for American History, University of Texas at Austin.

[119]C. W. McMillan to E. E. Saulmon, March 15, 1968.
"Resolutions Adopted at the 92nd Texas and Southwestern Cattle Raisers Association Convention," *The Cattleman* 55, no. 11 (1969): 31.
"Proposed Revisions to Federal Regulations on Movement of Cattle Because of Brucellosis," Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings January 12 – September 20, 1968, Dolph Briscoe Center for American History, University of Texas at Austin.

them.[120] Cattle owners argued that testing cattle that could not spread the disease such as calves under 8 months of age just placed an undue burden on the industry and made it impossible for cattle owners in non-certified areas to comply with the proposed changes.[121] Some state animal health agencies also worried about the potential impact of the changes to the UMR. In Texas, the state legislature only passed brucellosis control legislation with the provision that the Texas Animal Health Commission made no regulations regarding the movement of official vaccinates under the age of 30 months or prevent the movement of cattle to and from land owned by the same person, making the committee unable to comply with the UMR suggested regulations.[122] Many range cattle owners, meat producers, market owners, and state animal health agencies worried about the consequences of the transportation rule changes and worked to fight against their implementation in January 1968.

Criticism of the Accelerated Brucellosis Eradication Program

The critiques of the UMR changes also opened the door for critics of the program who continued to oppose it based on economic and scientific reasons. Just like those who opposed the formation of a state-federal cooperative program in the late 1940s and early 1950s, these critics worried about the cost of eradication and whether using current testing methods and vaccination could lead to eradication.[123] These cattle owners and veterinarians questioned the effectiveness and accuracy of the

[120]C. W. McMillan to E. E. Saulmon, March 15, 1968.
"Proposed Revisions to Federal Regulations on Movement of Cattle Because of Brucellosis".
Bill Freeland, "Texas Loses Bid for Brucellosis Order Delay," *Texas Co-op Power* 24, no. 10 (1968), Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings January 12 – September 20, 1968, Dolph Briscoe Center for American History, University of Texas at Austin.
[121]"Resolutions Adopted at the 91st Texas and Southwestern Cattle Raisers Association Convention," *The Cattleman* 54, no. 11 (1968): 106.
Freeland.
[122]"Brucellosis Legislation," 29-31.
Freeland.
[123]Pickard, "Brucellosis Eradication Versus Control," 80.
A. M. Prickard to Bill Wedemeyer, December 22, 1967, Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings February 1966 – December 22, 1967, Dolph Briscoe Center for American History, University of Texas at Austin.

agglutination test, including the new card test, especially when used on vaccinated cattle and the feasibility of achieving eradication under the existing program.[124] Unlike earlier protests of the program, most of those who opposed the program in the mid and late 1960s believed in the importance of brucellosis control and that the disease impacted range cattle as well as dairy cattle. However, they thought that range cattle owners had enough cattle to lose some to disease. For this reason, they preferred a federal control program that allowed for eradication in dairy areas with test-and-slaughter and control with vaccination in range areas with surplus cattle. Testing of cattle moving interstate or between designated areas would prevent the spread of the disease from control to eradication areas under this program.[125] The people who supported this program felt that this combination plan would be more economical than trying for eradication everywhere and that the current "brucellosis program can be much more costly to the producer than living with the disease under the control of vaccination."[126] The program proposed under this control system was not that different than the original state-federal program that allowed for both vaccination and test-and-slaughter plans. The difference lay in the goal of control instead of eradication and the belief that a cattle owner could have a disease-free herd or a vaccinated herd, but not both since vaccination led to a small number of cases. They also thought that eradication was impossible since the MCT program missed cases in untested market cattle and the agglutination test itself resulted in false negatives.[127] The range cattle owners and veterinarians who opposed the Accelerated Brucellosis Eradication Program still wanted some form of brucellosis control and research into better methods of testing and vaccination. Years of education and awareness about the disease seemed to have resulted in recognition that the disease could not go unchecked in the

[124]Pickard, "Brucellosis Eradication Versus Control," 16.
Minutes of the Meeting of the Animal Health Committee, Wichita Falls 6-17-66, 15.
[125]A. M. Pickard to G. F. Smith, January 10, 1967, Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings February 1966 – December 22, 1967, Dolph Briscoe Center for American History, University of Texas at Austin.
[126]Pickard, "Brucellosis Eradication Versus Control," 80.
[127]*Minutes of the Meeting of the Animal Health Committee, Wichita Falls 6-17-66*, 15-17.
A. M. Prickard to Bill Wedemeyer, December 22, 1967.

nation and that a program needed to be in place to achieve this control. The tools, methods, and goal of the program, not the existence of a control program, became the issue for opponents of the state-federal cooperative.

The USDA responded directly to these concerns about the accuracy of agglutination testing, the effectiveness of the vaccine, and the cost of eradication. They argued that the agglutination test was the best method of determining if an animal had brucellosis, that supplemental testing lowered the incidence of false positives and false negatives, and that eradication was possible using this test-and-slaughter plan.[128] After eradication, states and cattle owners could spend less on monitoring and preventing the disease. Veterinarians from the Agricultural Research Service agreed with opponents of the plan that vaccination alone could not lead to eradication but advocated for its use in high prevalence areas to reduce the rate of infection and then putting a test-and-slaughter plan in place to eradicate the disease entirely.[129] Brucellosis-free meat producing states like Nevada and the large and densely cattle-populated dairy state of Wisconsin served as examples of how cattle owners in any situation could achieve eradication in their herds and state.[130] Supporters of the state-federal brucellosis plan countered the scientific evidence of opponents with their own scientific claims. Each side used veterinarians and animal medicine research to justify its position and each claimed scientific authority on the issue of brucellosis. Those in favor of eradication looked at data on testing accuracy and saw a highly effective test when done correctly and in cooperation with supplemental testing while those who favored control looked at the same data and concluded that without 100% accuracy, the testing program could never achieve eradication.[131] Both sides of the debate on control versus eradication interpreted the same

[128]R. J. Anderson to Bill Wedemeyer, November 13, 1967, Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings February 1966 – December 22, 1967, Dolph Briscoe Center for American History, University of Texas at Austin.
[129]*Minutes of the Meeting of the Animal Health Committee, Wichita Falls 6-17-66*, 6.
[130]Ibid., 2-3.
[131]R. J. Anderson to Bill Wedemeyer, November 13, 1967.
A. M. Prickard to Bill Wedemeyer, December 22, 1967.

studies in different ways based on their perspective on the end goal of the brucellosis program.

In order to further explore the scientific claims of each side of the debate, the Texas and Southwestern Cattle Raisers Association contracted Texas Tech University to conduct a study on the current and proposed brucellosis program to determine the possibility of eradication under the program.[132] The study would address the concerns brought up by critics of the state-federal program including the compatibility of test-and-slaughter and vaccination, the possibility of using a killed strain vaccine, and the cost of eradication or control and would recommend what future course of action range cattle owners should take based on a review of scientific literature on brucellosis.[133] Just as both advocates of control and eradication utilized science to support their program, the TSCRA hoped to use scientific research to determine the best course of action for the cattle raising industry in Texas.[134] They thought that research into the science of types of testing and the vaccine would clarify the best way to deal with brucellosis. As the study began, the TSCRA requested that state agents stop encouraging participation in the eradication program and that cattle owners postpone joining the program until the study released its findings so that cattle owners could make their decision based on "factual

[132]"Resolution Passed by the Board of Directors of the Texas Southwestern Cattle Raisers Association at the 4th Quarter Meeting in Fort Worth, March 7, 1966," Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings February 1966 – December 22, 1967, Dolph Briscoe Center for American History, University of Texas at Austin.

[133]Department of Animal Husbandry Texas Technology Conference, *Project proposal submitted August 22, 1966*, 2-3, Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings February 1966 – December 22, 1967, Dolph Briscoe Center for American History, University of Texas at Austin.

[134]This was an extension of the long standing tradition of using scientific methods to address agricultural issues as discussed in the first two chapters. The USDA and cattle owners often used land-grant universities and agriculture experiment stations to conduct this research though not in this case. Texas Tech was not an actual land-grant college, but it operated on a similar model with a significant agricultural research department. Texas A&M, the official land-grant college of the state, turned down a request from the TSCRA to conduct the study because the university staff thought they could not carry out the study. The refusal to conduct the study caused some members of the TSCRA to accuse the staff at Texas A&M of being biased towards the eradication program.

Fred J. Benson to Frates Seeligson, May 2, 1966. Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings February 1966 – December 22, 1967, Dolph Briscoe Center for American History, University of Texas at Austin.

Frates Seeligson to Alvin Burger, April 27, 1966, Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings February 1966 – December 22, 1967, Dolph Briscoe Center for American History, University of Texas at Austin.

information."[135] Other cattle organizations worried about the Texas and Southwestern Cattle Raisers Association pulling its support from the state program and the potentially devastating economic consequences for the state, especially if the proposed changes to interstate transportation became part of federal regulations.[136] After considerable debate, the Texas Animal Health Commission ultimately decided to continue its effort to enroll herds and areas in the state eradication program.[137] The eradication program continued to grow in Texas during 1966 and 1967 with almost all of the counties in the western half of the state and nearly half of the counties in the eastern part of the state enrolled.[138]

When the study group announced its finding in December 1967, the decision to keep enrolling herds seemed to be validated. The results of the study confirmed that while agglutination testing methods had their problems, the existing program worked better than a method of voluntary vaccination or other attempts to merely control the disease. The authors of the study noted that the eradication program decreased in effectiveness when fewer areas participated. They recommended more research into more accurate testing, improving the vaccine, and finding a new vaccine along with recommending the adoption of the proposed changes to interstate transportation rules.[139] The study affirmed the work of the Accelerated Brucellosis Eradication Program while still requesting more

[135]The Texas Animal Health Commission ran the Texas brucellosis control program, but the Texas and Southwestern Cattle Raisers Association exerted a large amount of influence over the animal health issues in the state. Not only did they represent many of the state's cattle owners in a state where the cattle industry was valued at over $900 million, but a number of members held political offices at one point or another. This included Dolph Briscoe Jr. who served as a state representative in the 1950s and owned and managed the largest ranch in the states starting in the mid-1950s. He raised $3 million dollars for screwworm eradication which encouraged the state and federal government to create an eradication program for the pest in the Southwest. His relationship with the state animal disease control agency, his political clout, and his economic status enabled him to exert influence over the Texas Animal Health Commission including calling a special meeting to discuss suspending advocacy for the brucellosis program while the TSCRA was conducted.
United States Bureau of the Census, 12, http://usda.mannlib.cornell.edu/usda/AgCensusImages/1964/01/37/797/Table-07.pdf (accessed February 10, 2013).
"Dolph Briscoe Bibliography," Briscoe Center for American History, http://www.cah.utexas.edu/about/briscoe/bio.php (accessed February 10, 2013).

[136]C.G. Scruggs to Dolph Briscoe Jr., June 2 1966.

[137]Resolution at Meeting of Texas Farm Bureau in Corpus Christie, November 15, 1966, Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings January 12 – September 20, 1968, Dolph Briscoe Center for American History, University of Texas at Austin.

[138]"Brucellosis and Screwworm Maps," *The Cattleman* 53, no. 12 (1967): 72.

[139]"An Investigation and Evaluation of the Brucellosis Eradication Program in the State of Texas," 26-30, 116-124. Hudson, and Zinn, Appendix, 3-6.

research just as the National Brucellosis Committee had done.

Implementation of the Federal Regulations on Interstate Cattle Transportation

Around the time of the publication of the TSCRA commissioned study, it became apparent that the proposed interstate transportation revision to the federal regulations was going to be put into effect.[140] Unlike changes to the Uniform Methods and Rules, which served as suggestions for states, revising the Code of Federal Regulations modified federal laws governing the interstate movement of cattle. Unable to stop the implementation of these revisions, many cattle owners advocated modifying the revisions to exclude certain types of cattle while states with non-certified areas argued for more time before the revisions went into effect. In response to concerns from certified cattle herd owners in non-certified areas, the USDA agreed to rewrite the regulation to allow for free movement of cattle from known certified herds in non-certified areas.[141] This eliminated the problem of certified cattle being presumed diseased if they originated from a non-certified area and decoupled their health status from the status of the whole area for the purpose of interstate transport. In addition, the United States Livestock Sanitary Association and the National Brucellosis Committee advocated for creating an exception to testing for calves under 8 months of age, steers, and spayed heifers.[142] Studies showed that these animals rarely spread brucellosis and, since the purpose of the revision was to prevent the reinfection of certified-free and modified certified areas, these animals did not need to be tested for

[140]R.J. Anderson to Don C. King, January 10, 1968, Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings January 12 – September 20, 1968, Dolph Briscoe Center for American History, University of Texas at Austin.
Freeland.
[141]R.J. Anderson to Don C. King, January 10, 1968.
[142]"1968 Recommendations of the National Standing Committee, Livestock Conservation Inc.," 3, Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings January 12 – September 20, 1968, Dolph Briscoe Center for American History, University of Texas at Austin.
Bob Laramore, "Recommendations of the National Brucellosis Committee," in *Proceedings of the National Brucellosis Committee and Progress Report of the Cooperative State-Federal Brucellosis Eradication Program* 53 (Hyattsville, MD: United States Department of Agriculture, 1968).

infection. By carving out these exceptions to the proposed regulations, the USDA tried to gain support from dissenting parts of the industry just as they had during the establishment of the state-federal program.[143] The program still needed the cooperation of industry to achieve eradication, so the Department of Agriculture tried to exclude as many cattle as possible from the restriction on cattle movement to decrease the economic burden on cattle producers in non-certified areas while still preventing the spread of brucellosis.

The USDA also needed the cooperation of state animal disease control agencies to enforce the changes to the Code of Federal Regulations and encourage modification of state brucellosis laws so that they matched the UMR regulations. Without the support and work of state agencies, the state-federal program made little or no progress. These agencies in non-certified states worried that the new transportation regulations would hamper their efforts to achieve modified status by diverting staff and funds from area testing to policing interstate transport. Many also thought that they would soon achieve modified certified state status and therefore avoid the economic impact of the changed regulations if the Department of Agriculture delayed the start of the new regulations.[144] These state animal agencies asked for an extension on the implementation of the changes to the federal regulations so they could have more time to reach certified status. National and state cattle owner organizations also advocated for a delay to allow for Oklahoma, Texas, Florida, and Nebraska to achieve modified certified status.[145] Instead of starting in January 1969, these organizations wanted another year and half to allow

[143]T.L. Roach Jr., to All Members of the Texas Southwestern Cattle Raisers Association Special Brucellosis Committee, April 17, 1968, Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings January 12 – September 20, 1968, Dolph Briscoe Center for American History, University of Texas at Austin.

[144]"Resolution, March 11, 1968".

[145]"Proposed Revisions to Federal Regulations on Movement of Cattle Because of Brucellosis".
American National Cattleman's Association, "Brucellosis Committee Report, January 10, 1967, Colorado Springs, CO," Texas and Southwestern Cattle Raisers Association Records, Box 3E107, Folder – Conventions and Executive Meetings, March 2, 1966 – August 3, 1968, Dolph Briscoe Center for American History, University of Texas at Austin.
"Memo to file, Relative to Conversation with Dr. R. J. Anderson, ARS, Dr. Ed Sheilf, Dr. Saulman, November 29, 1967, Subject: Proposed Changes in the Brucellosis Rules and Regulations," Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings January 12 – September 20, 1968, Dolph Briscoe

all areas more time to start and advance their eradication programs.[146] Initially, the USDA delayed the program until later in 1968, but the need for a longer delay became necessary as states other than Florida, Texas, and Wyoming missed modified certified state status at the start of 1968 as originally predicted. Significant progress in the program had been made with 92% of counties in the United States certified under the program, but South Dakota, Louisiana, Nebraska, Oklahoma, Texas, and Florida all had counties that either had not entered their state programs or had not reduced their rate of infection enough to achieve modified certified status.[147] The National Brucellosis Committee suggested moving the effective date to January 1, 1969 to allow even more time for compliance, so the Department of Agriculture set the final date for implementation of the new regulations as August 1, 1969.[148] By allowing more time for states and industry to achieve modified certified brucellosis status in non-certified areas, the USDA enrolled more areas in the state-federal cooperative while addressing the concerns of its partner states and cattle owners. By compromising on timing and on exemptions to the new rules, the Department of Agriculture maintained the support of both dairy and meat producing states and industries while still creating a policy that prevented the spread of brucellosis and encouraged participation in the program through de facto quarantine of non-certified cattle.

Center for American History, University of Texas at Austin.

[146]C. W. McMillan to the American National Cattlemen's Association Board of Directors, Executive and Legislative Committees, State Presidents and Secretaries, Local Association Presidents and Secretaries, March 31, 1966, 3. Texas and Southwestern Cattle Raisers Association Records, Box 3E114, Folder – Classified Files May 13, 1967 – June 20, 1968, Dolph Briscoe Center for American History, University of Texas at Austin.
"Resolutions Adopted December 4, 1967 at the Texas Southwestern Cattle Raisers Association Board of Directors' Meeting in Fort Worth," Texas and Southwestern Cattle Raisers Association Records, Box 3E108, Folder – Conventions and Executive Meetings February 1966 – December 22, 1967, Dolph Briscoe Center for American History, University of Texas at Austin.

[147]H. C. King, "The Cooperative State-Federal Brucellosis Eradication Program, A Progress Report," in *1970 Proceedings of the National Brucellosis Committee of Livestock Conservation, Inc., and Progress Report of the Cooperative State-Federal Brucellosis Eradication Program* 1 (Washington, D.C.: United States Department of Agriculture, 1970)
American National Cattlemen's Association, *Brucellosis Committee Report, January 22, 1968, Oklahoma City, OK*, 1.

[148]Wixom, "Report of the United States Animal Health Association Committee on the Cooperative State-Federal Brucellosis Eradication Program," 1970, 42.
Bob Laramore, 53.
H. G. Wixom, "Report of United States Animal Health Association Committee on Brucellosis Eradication Cooperative State-Federal Program," in *1969 Proceedings of the National Brucellosis Committee of Livestock Conservation, Inc., and Progress Report of the Cooperative State-Federal Brucellosis Eradication Program* 51 (Washington, D.C.: United States Department of Agriculture, 1969).

Legal Challenges to State Brucellosis Eradication Programs

While the states and cattle owner organizations accepted the necessity of the brucellosis program and worked with federal authorities to tailor the program to meet the needs of industry and each state, some individual cattle owners still questioned the necessity of the eradication program and the science of agglutination testing. Two court cases in the late 1960s threatened to derail the brucellosis eradication program in the two states that still had the largest number of non-certified counties, Florida and Texas. Both cases challenged the constitutionality of the state eradication program and the science behind the program, but the 1968 Florida case built its argument around the necessity of the program while the 1969 Texas case centered on the accuracy of testing. The first case began when commissioner of agriculture for Florida, Doyle Conner, decided to use legal recourse to force cattle owners to participate in the state program. The cattle owners countersued and the case of *Conner v. Carlton* went before a circuit court judge in August 1968. The state argued that it had the right to enforce laws that prevented the spread of infectious disease while the cattle owners argued that the disease posed no epidemic health threat to cattle or humans.[149] The second case involved a cattle owner, R.J. Nunley, who submitted his cattle for card testing as part of the Texas eradication program in 1968. Initially, seventeen cattle tested as reactors on the card test so the state animal health agency retested the cattle with three types of agglutination tests to confirm their reactor status. The three additional tests produced three different results on how many of the seventeen cattle had been exposed to *Brucella*. Nunley sued the Texas Animal Health Commission to stop enforcement of the state brucellosis regulations due to the inaccuracy of the testing system.[150] In both cases, each side called state animal health officials and cattle owners to the stand, but they also called veterinarians as expert witnesses to

[149]Joe Rosenau, "Conner to Appeal or Change Statute," *The News Tribune* (Fort Pierce, FL), September 11, 1968.
[150]Arthur Moczygemba, "Brucellosis Law Upheld," *The Cattleman* 56, no. 7 (1969): 30.

speak to the effectiveness of the program and the accuracy of testing. Like earlier in the decade, both sides claimed scientific authority on the issue of brucellosis. The state had its own veterinarians and federal veterinarians attached to the brucellosis program while cattle owners relied on independent veterinarians who disagreed with the eradication program. These independent experts were the same individuals who critiqued the state-federal program after the announcement of the changes to interstate transportation regulations, and they used the same arguments they did then, hoping the courts would strike down state regulations.[151] The court became another way for critics of the brucellosis program to stall or stop the program since they had not managed to change or end the program through industry group advocacy.

While both cases occurred around the same time, the Florida case preceded the Texas one and ultimately impacted it and future brucellosis court cases. In 1968, the circuit court judge struck down Florida's brucellosis regulations in *Conner v. Carlton* though the program continued to certify at the recommendation of the Florida Cattlemen's Association and the state Animal Industry Technical Committee.[152] The judge sided with the cattle owners and struck down the state eradication program as unconstitutional because he sided with their scientific experts rather than those called by the state.[153] In his decision the judge wrote

> that there is no threatened or actual epidemic or emergency in the cattle industry in the State of Florida or in Martin County, Florida, due to such disease at this time. In fact, the evidence shows that during the last ten or fifteen years or more, the control of brucellosis in cattle is being accomplished

[151]Ibid., 30.
Ed Gluckler, "Cattlemen Say Government Used 'Pressure' in Tests," *The News Tribune* (Fort Pierce, FL), August 29, 1968, afternoon edition.
[152]E. A. Schilf, "Situation Report on the Florida Brucellosis Case," in *1969 Proceedings of the National Brucellosis Committee of Livestock Conservation, Inc., and Progress Report of the Cooperative State-Federal Brucellosis Eradication Program* 55 (Washington, D.C.: United States Department of Agriculture, 1969).
[153]Ed Gluckler, "Cattle Tests Enjoined: Court Finds Against Brucellosis Program," *The News Tribune* (Fort Pierce, FL), September 11, 1968, afternoon edition.

> quite well through a vaccination program. The Court further finds that as the bovine brucellosis eradication program is now being administered by the Commissioner of Agriculture in Martin County, Florida, that is, under the tests that are being used to determine which animals are infected, some healthy animals are shown by the tests to be infected, when in fact they are not infected and such animals are required to be sent to slaughter along with infected animals and sent as infected as animals.[154]

He thought the state overstepped its police power in enforcing the brucellosis eradication regulations and illegally seized the property of cattle owners when they condemned reactor cattle to slaughter.[155] The state immediately filed an appeal and the Florida Supreme Court heard the case in May 1969. The court reversed the decision of the trial judge. In the eyes of the state supreme court, the evidence demonstrated that the state had the right to establish a brucellosis eradication program because "brucellosis disease in domestic animals represents a dangerous subject of "compelling public interest" sufficient to justify making an exception to the fundamental rule of due process."[156] The court also decided that "the program undertaken thereunder lies primarily within the competence of experts in the medical and veterinary fields. Absent a clear showing of invalidity of the enabling statutes or an arbitrary, unreasonable administration of the program, the courts will not interfere. No such showing has been made in this case."[157] Not only did the court side with the state department of agriculture, but it also wrote that these experts had the power to administer and shape the eradication program, not the courts. This prevented future challenges to the Florida brucellosis eradication program and the supreme court decision also affected other state decisions.

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[154]*Doyle Conner v. Reuben Carlton et al.*, 223 Southern 2nd, 324 (Supreme Court of Florida, 1969), 325-326, http://scholar.google.com/scholar_case?case=8746525604412392 38&q=conner+v+carlton&hl=en&as_sdt=2,5 (accessed February 11, 2013).

[155]Ibid., 327.
Ed Gluckler, "Cattle Tests Enjoined: Court Finds Against Brucellosis Program".

[156]*Conner v. Carlton et al.*, 328.

[157]Ibid., 329.

The *Nunley v. Texas Animal Health Commission* case came before a trial judge after the decision of the Florida Supreme Court in 1969. After two days of testimony, the judge denied any of Nunley's requests to stop the Texas brucellosis eradication program and ordered that his cattle be retested to determine their reactor status.[158] The 1971 appeal to the state Court of Civic Appeals also sided with the state animal health agency. The court dismissed the main argument of inaccurate testing because

> not only have we already concluded that the evidence supports the finding that the card test is reasonably reliable and accurate, but the evidence shows that the Texas program is essentially the same as that followed throughout the United States, and that such program has been effective in the control and eradication of brucellosis.[159]

The Texas court sided with program experts as scientific authorities on testing just as the Florida Supreme Court had done in its brucellosis case decision. The outcome of the *Conner v. Carlton* case most likely impacted the Nunley case and the judges cited the same doctrine of "compelling public interest" as justification for the eradication program.[160] The existence of compelling public interest meant that the state had the right to mandate the destruction of diseased cattle since "where the public interest is involved preferment of that interest over the property interest of the individual, to the extent even of its destruction, is one of the distinguishing characteristics of every exercise of the police power which affects property."[161] In both cases, the state courts upheld state-federal cooperatives as necessary to stop the spread of an epidemic disease and ruled that program veterinarians had the authority to determine the best way to conduct the program since they were scientific experts in eradicating brucellosis. These court cases affirmed state and federal animal disease control officials as expert scientific authorities on brucellosis eradication.

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[158]Moczygemba, 30.
[159]*R.J. Nunley v. Texas Animal Health Commission*, 471 Southwest 2nd, 144 (Court of Civil Appeals of Texas, San Antonio, 1971), 148, http://scholar.google.com/scholar_case?case=13872295874156652583&hl=en&as_sdt=2,44 (accessed February 13, 2013).
[160]Ibid., 148.
[161]Ibid., 151.

The Accelerated Brucellosis Eradication Program at the End of the 1960s

The decisions in both cases and the denial of further appeals closed the door on legal action against the brucellosis eradication programs in the two states with the most non-certified areas.[162] With the new interstate transportation regulations in place at the end of the decade, continued cooperation between industry, state, and federal organizations, and court decisions favoring the eradication program and the science behind it, the Accelerated Brucellosis Eradication Program moved closer to the goal of total eradication of the disease. Eighteen states achieved certified-free status by the end of the decade and all but five obtained modified certified status.[163] Only 81 counties in six states had not achieved modified certified status and therefore were affected by the new transportation regulations put in place by the USDA.[164]

[162]H. C. King, "The Cooperative State-Federal Brucellosis Eradication Program, A Progress Report," 1.
[163]H. G. Wixom, "Report of the United States Animal Health Association Committee on the Cooperative State-Federal Brucellosis Eradication Program," 41.
[164]H. C. King, "The Cooperative State-Federal Brucellosis Eradication Program, A Progress Report," 1.

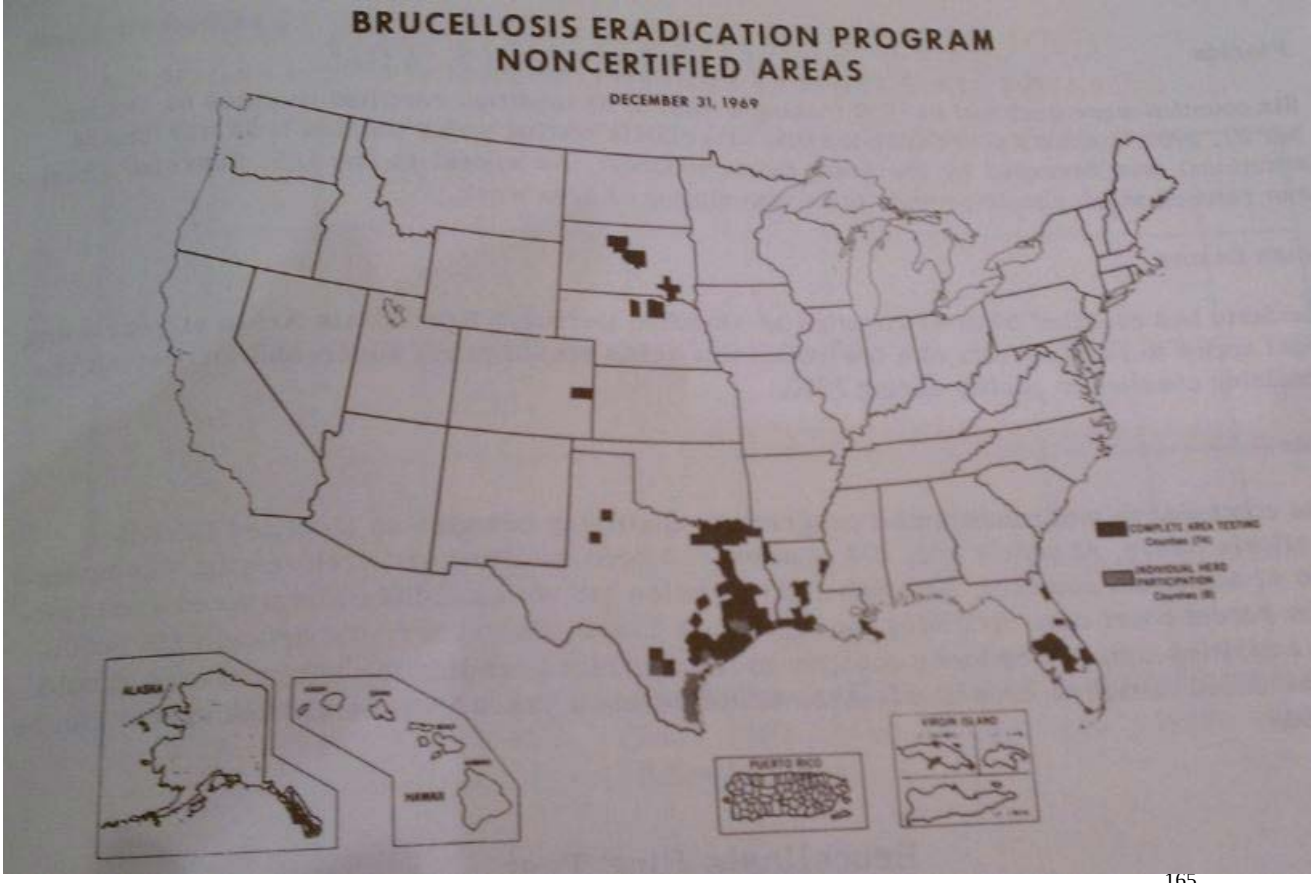

Image 5.7: Map of Brucellosis Eradication Program Non-certified Areas as of December 31, 1969[165]

The modifications to the brucellosis eradication program had led to an expansion of the program and a decreased rate of infection.[166] The decreased prevalence of brucellosis in animals led to a corresponding decreased prevalence in human brucellosis. This decrease in the number of cases in both populations affirmed the public health strategy of controlling the disease in animals to control the disease in humans. In 1969, the Communicable Disease Center reported only 230 cases of undulant fever and about 70% of those investigated named swine as the possible source of infection.[167] The success of the bovine brucellosis eradication program and the increased incidence of swine related undulant fever cemented swine as a target for the state-federal program with continued monitoring of cattle needed to prevent the reinfection of certified herds and areas. By the end of the 1960s, the goal of brucellosis eradication by the mid-1970s seemed possible.

[165]Ibid., 5.
[166]Charles Dancer, "Report of the National Brucellosis Committee to Livestock Conservation, Inc.," in *1970 Proceedings of the National Brucellosis Committee of Livestock Conservation, Inc., and Progress report of the Cooperative State-Federal Brucellosis Eradication Program* 44 (Washington, D.C.: United States Department of Agriculture, 1970).
[167]Ibid., 44.

Conclusion

The Department of Agriculture worked with state animal health officials, veterinarians, and cattle owners to standardize brucellosis eradication across the country while at the same time allowing for flexible state programs and herd management to increase participation in the newly created Accelerated Brucellosis Eradication Program. The state-federal program that began in 1954 allowed states to modify the program to suit their local cattle industry, utilized private veterinarians to expand testing and vaccination of cattle, and worked with many different private and public organizations and agencies to educate producers about brucellosis and the eradication effort in order to grow the cooperative and make it accessible to as many cattle owners as possible. The brucellosis eradication program flourished in the late 1950s as more areas joined it and states started achieving certified-free status in 1960.

As part of the eradication program, the Uniform Method and Rules had a significant impact on the way the disease status of an animal and an area was determined. The health of an individual animal affected the status of its herd, area, and state. In order to gain certified-free status, a cattle owner needed to eradicate the disease in his or her whole herd. Just one infected animal downgraded the status of the group as a whole and had the potential to change the certification of the herd's area. The brucellosis eradication program focused on large cattle populations by grouping herds into an area, but ultimately the status of that region was determined by the health of each animal. This health status served as a passport since herds had to be either certified-free or the individual animal had to test negative in order to move interstate. Once an animal was vaccinated or tested, cattle owners used tags, tattoos, and brands to identify the reactor and vaccination status for each animal. These markings directly identified an animal based on its brucellosis status or vaccinate status. Each animal had its own disease classification through testing that was physically manifested through some type of marking that designated it as being eligible or not for transportation to a new herd or area.

Disease status of animals, herds, areas, and states served as the backbone of the eradication program and as a result, testing became one of the most important tools in the effort to eliminate brucellosis in cattle. The development of new brucellosis diagnostic tests and identification strategies from the late 1940s to the early 1960s made it easier for cattle owners and animal health officials to find and isolate reactors and determine the disease status of animals and herds. Animal health officials, epidemiologists, and veterinarians utilized the brucellosis ring test, market cattle identification, and market cattle test to trace brucellosis infection to specific herds and animals. These monitoring tests represented a different epidemiological approach to the eradication program than waiting for herd owners to request testing. In theory, the monitoring system actively tested all dairy and beef herds through their consumer products. It was less expensive and less invasive than individual herd testing since animal health officials only had to test herds if their milk or animals tested as reactors. In addition, monitoring using BRT, MCI, and MCT allowed inspectors to identify diseased herds not in the eradication program. States used epidemiologists to trace back infection and veterinarians to test the herds who had positive tests. This process essentially enrolled animals that may not have been part of the state-federal cooperative into the brucellosis eradication program and determined their brucellosis certification designation.

The understanding of cattle health as it related to brucellosis and the way each animal's disease status was determined changed in the second half of the 1960s as program officials contemplated implementing new interstate transportation regulations in order to prevent reinfection of modified certified and certified-free herds. Under the proposed changes to the Code of Federal Regulations, the health of an individual animal no longer served as a passport allowing it to move to any area if it tested negative as a brucellosis reactor. Instead, the disease status of the animal's area determined its health status and its eligibility to move to a herd in a certified area. This change in federal regulations effectively turned non-reactor cattle and certified-free herds in non-certified areas into diseased cattle.

Epidemiologically, animal health officials no longer had to prove that cattle had been exposed to brucellosis. The fact that animals grazed in a non-certified area meant that they were considered exposed regardless of their actual contact with the *Brucella* organism. Each herd in a particular area still contributed to the area's brucellosis status through routine testing, but the health status of each animal no longer acted as the passport that allowed non-reactor cattle to move without restriction. The proposed transportation laws changed producers' ability to transport cattle by shifting health status from an individual level to a population level, changing the epidemiological focus of the program from the individual animal to the area and the state.

By trying to change brucellosis related shipping laws, the USDA not only hoped to prevent reinfection of certified herds, but also hoped to encourage participation in the program. By preventing non-certified areas and states from shipping cattle to certified areas and states, the new rules would effectively create a quarantine without actually declaring any quarantine lines. The attempt to pass these new regulations met with resistance from cattle owners and state officials in non-certified states like Texas and Florida and opened the door to critics of the brucellosis eradication program. Many range cattle owners and veterinarians who had initially rejected attempts to create a state-federal brucellosis eradication cooperative in the late 1940s and early 1950s began to question the feasibility of eradication under the program. Instead of a policy that promoted eradication of the disease, they wanted one that allowed for eradication among dairy herds through test-and-slaughter and control of the disease among range cattle herds through vaccination. They also questioned the use of agglutination tests to assess disease status of cattle since even the new monitoring tests and the card test could only determine if any animal had been exposed to *Brucella* at some time, not if it was actively infected with the disease or a carrier. While the testing technology had changed after World War II, the underlying principle had not altered since the initial attempts to determine exposure to the bacteria in the early twentieth century. Critics of the program wanted more research on brucellosis and its causal bacteria

and on the most effective and cost efficient method of controlling it in both dairy cattle and range cattle. They hoped to delay or modify the purposed changes to the federal code and the state-federal program until studies determined if the new regulations and the existing cooperative would actually prevent the spread of brucellosis or if they would just hamper business practices.

Just as they did during the creation of the Accelerated Brucellosis Eradication Program, the United States Livestock Sanitary Association and the National Brucellosis Committee provided a space for supports and critics of the state-federal program to design a compromise solution that generated support from state animal health officials and cattle owners from different segments of the cattle industry. The eradication program still depended on the support of each state's animal agency and individual cattle owners since it was still a cooperative program. The Department of Agriculture did not want states to drop out of the program or any cattle industry groups to advocate not participating once the new interstate shipping rules went into effect. Based on the USLSA and NBC's suggestions, the USDA rewrote the federal regulations to allow certified cattle in non-certified areas to move freely, which disassociated their health condition from area or state brucellosis certification designation and returned the determination of eligibility for interstate transportation back to the disease status of an individual animal. It also made testing exceptions for calves, steers, and spayed heifers. In addition, the department delayed the implementation of the new federal code, allowing states more time to gain at least modified certified status. By designating certain types of cattle as exempt from the changed federal regulations and delaying the start date of the new code, the Department of Agriculture hoped to calm the concerns of critics and maintain participation in the state-federal brucellosis eradication program

While the federal government, supporters of the eradication efforts, and the programs critics reached a compromise over federal interstate shipping regulations, some cattle owners questioned the necessity of the brucellosis cooperative in court. Cases in Florida and Texas during the late 1960s

challenged both states' brucellosis programs by claiming that the state-federal eradication program was unnecessary to maintain animal or human public health and that it illegally deprived cattle owners of their property due to inaccurate testing. The Florida and Texas animal disease control agencies and the cattle owners suing each state used expert scientific testimony to argue for their position. Often using the same studies on brucellosis epidemiology but interpreting them differently, veterinarians called to testify for the state and for the cattle owners claimed scientific authority on the subject of brucellosis, testing, and the need for an eradication program. These government employed and independent veterinarians had previously participated in the debates over brucellosis control and eradication in the 1940s, 1950s, and 1960s, and used the same arguments as before during the cases. Ultimately, the Florida State Supreme Court and the Texas Court of Civic Appeals upheld the state-federal brucellosis program as a valid use of police power due to compelling public interest for controlling the disease in both animals and humans. As part of their decisions, the two courts also affirmed the scientific authority of state and federal veterinarians and legally established agglutination methods of testing as reliable. These court cases established the brucellosis eradication program as constitutional in two states where participation in the cooperative lagged behind other states and reaffirmed the science used to establish the testing protocols.

By the end of the 1960s, Department of Agriculture officials hoped that the Accelerated Brucellosis Eradication Program would soon lead to the end of bovine brucellosis. The cooperative effort still enjoyed support from most of the cattle industry, veterinarians, and states. Courts in Florida and Texas, two states with a higher prevalence of the disease, decided cases in favor of the state eradication programs and the science behind them. Only a small percentage of areas in a handful of states had not achieved modified certified status and therefore faced transportation restrictions under the new federal code regulations. Bovine brucellosis eradication seemed feasible in the 1970s under the modified rules and regulations of the state-federal program.

Chapter 6: Control or Eradication? The State – Federal Brucellosis Eradication Program, 1970 - 1977

By the end of the 1960s, the state-federal Accelerated Brucellosis Eradication Program experienced success in all states and two state courts upheld the program as a legal use of police power. New testing technology like card testing, brucellosis ring testing, and market cattle testing made it easier and more economical for state and federal officials to monitor cattle for the disease. As the majority of herds achieved certified brucellosis status, the program focused on eradication rather than control by deemphasizing vaccination in certified-free areas, increasing MCT and identification of beef cattle, and creating stricter regulations on moving animals from non-certified areas. These policies were designed not only to eradicate brucellosis but also to force non-certified areas and herds to comply with state and federal regulations. In order to maintain the support of industry, especially beef producers and states, the Department of Agriculture compromised on the details and executions to these policies. Brucellosis eradication seemed possible at the start of the 1970s and most advocates of the program hoped to achieve eradication by the middle of the decade.

While the industry-state-federal cooperative program moved forward at the end of the 1960s and supporters of the program negotiated with those who doubted the effectiveness of the brucellosis eradication effort in order to expand participation in the program, dissent from many beef producers and the range cattle owners continued. While the dissenting cattle owners viewed brucellosis as problematic and desired control of the disease, they argued that eradication was impossible due to the nature of the disease and the vaccine, testing policy, and a lack of funds and staff. As all areas finished brucellosis testing in the early 1970s, the USDA pushed for even stricter brucellosis regulations to close any gaps that allowed for the movement of diseased animals. These new regulations met with resistance from beef producers and state health officials in some states, particularly in the Gulf Coast region, once again threatening to break apart the cooperative program. Dairy producers also

experienced frustration with the program as herd reinfection increased and certified herds, areas, and states lost their status. Instead of heading towards eradication by the mid-1970s, the Accelerated Brucellosis Eradication Program seemed to be losing the support of industry and states. The question of control rather than eradication raised by range cattle owners and some veterinarians became the main issue for the program leading to congressional hearings and a scientific study conducted by the National Brucellosis Technical Commission on the future of the program. The brucellosis eradication program reached a crossroad in the mid-1970s; the cattle industry and animal health officials had to decide to eradicate brucellosis or just control the disease.

Eradication At Last? Changes In The Uniform Method and Rules In The Early 1970s

At the start of the 1970s, the Accelerated Brucellosis Eradication Program expanded to include all counties across the United States. The start of federal regulations requiring extra testing for non-certified cattle forced areas to comply with the eradication program rules in order to avoid the negative economic impact of limitations to transportation of animals. In states where cattle owners still resisted herd testing, animal health agencies and herd owners pursued legal action to decide if state agencies could require area testing. State court decisions in the early 1970s followed the precedents established by Florida and Texas courts in the late 1960s.[1] They declared the program a valid police power solidifying the right of state animal health agencies to force cattle owners to comply with the program. The court decisions also noted that the changes to the federal regulations made obtaining certified state status economically important due to the restrictions on shipping non-certified cattle.[2] With the power of the court behind them and significant economic interest, most states completed area testing in the

[1]*R. F. Gluck v. Texas Animal Health Commission*, 501 Southwest 2nd, 412 (Court of Civil Appeals of Texas, San Antonio 1973), http://scholar.google.com/scholar_case?case=10388005877873571896&hl=en&as_sdt=2,44 (accessed April 03, 2012).
Royce L. Johnson v. Texas Animal Health Commission, 520 Southwest 2nd, 810 (Court of Civil Appeals of Texas 1975), http://scholar.google.com/scholar_case?case=13516149346336179340&hl=en&as_sdt=2,44 (accessed April 03, 2012).
[2]*Gluck v. Texas Animal Health Commission*, 415.

first few years of the decade achieving state certified status. By 1972, Texas remained the only state without certification status and the Center for Disease Control reported only 190 human cases of the disease in the previous year.[3] With almost every state either certified-free or modified certified and the number of human cases dropping as the infection rate in animal reservoirs declined, the United States Animal Health Association (USAHA), formerly the United States Livestock Sanitary Association, and the USDA reaffirmed their goal of national bovine brucellosis eradication by 1975.[4] The end of the brucellosis threat as an economic and health problem in cattle and humans seemed to be in sight.

In order to accomplish the goal of eradication, the USAHA recommended new amendments to the Uniform Methods and Rules that further reduced the risk of exposing disease-free cattle to diseased cattle during its 1971 annual meeting. This included eliminating any titer tolerance for vaccinated cattle along with adjusting the age of testing for recertification and transportation, shortening the time between surveillance testing and herd blood testing, quarantining or slaughtering cattle exposed to animals with brucellosis in market channels, reducing the herd infection rate for modified certified areas, and requiring testing for cattle moving from any herds other than certified-free herds.[5] The policies built on the changes made to the UMR in the late 1960s and expanded the reach of testing. The new regulation requiring testing for transporting modified certified cattle aimed to prevent the spread of the disease and force states to achieve certified-free status, just like the earlier restrictions on moving non-certified cattle. The quarantine or slaughter of cattle that interacted with diseased cattle meant that MCT traced the disease back not only to the herd of origin, but to all cattle with which an infected animal interacted for more than twenty-four hours once it entered market channels. These close contact animals become suspect regardless of their own test status. Under the program's rules, the presence of

[3]Center for Disease Control, "CDC Brucellosis Surveillance, Annual Summary – 1972," *Brucellosis Surveillance, Annual Summary* (1974): 1.
[4]"Brucellosis Committee Gears Up to Reach Eradication Goal," *Hoard's Dairyman* 117, no. 1 (1972): 38.
"December 31, 1975 Is New Brucellosis Eradication Goal," *Hoard's Dairyman* 117, no. 8 (1972): 561.
[5]"Brucellosis Committee Gears Up to Reach Eradication Goal," 38.

one reactor animal tainted the herd and its health status impacted the status of the whole herd. The proposed change to the UMR broadened this impact to include the disease status of cattle originating from other herds. It also shifted the way people conceptualized the spread of brucellosis. Previously, locating the source of infection and other diseased animals focused around the herd from where the infected animal came, but the new policy recognized the possibility of disease transmission anywhere in the market channel including auctions and feedlots.[6] The spread of the disease occurred not just on the farm and range, but also in market settings, and by labeling cattle that came in contact with diseased animals as suspect just like animals from their originating herds, the new regulation accounted for the many different places where cattle interacted.

The changes to the UMR went into effect for fiscal year 1972, but by the next annual USAHA meeting, hopes for eradicating brucellosis by the end of 1975 dimmed. The USDA reported that the rate of infection detected by brucellosis ring testing and market cattle testing barely changed during the year and that eight states did not modify their state regulations to match the Uniform Methods and Rules. Federal officials threatened to remove certification status from states that did not adopt the new regulations.[7] The removal of certification would negatively impact the economics of these states, essentially preventing the transportation of cattle from nonparticipating states to participating states.

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[6]Cattle feeding had existed since the colonial era, but the role of feedlots in the cattle industry increased after World War II. Many factors contributed to this including greater domestic demand for beef due to increased income and urbanization, and increased foreign demand after the devastation of European cattle during the war along the development of antibiotics and new grain growing technology. The first concentration of large commercial feedlot operations with over 10,000 head of cattle started in California in the 1950s. In the 1960s, these commercial feedlots expanded across the Southwest and Great Plains states including Arizona, Texas, Colorado, and Kansas. The rise of feedlots increased the ratio of beef cattle to dairy cattle so that by 1970 there was more than double the number of beef cattle than dairy cattle in the United States. As the feedlots grew bigger, slaughterers developed near the feedlots, decreasing the need to transport feeder cattle to markets for slaughter. The implementation of tagging at point of first contact and the shift in thinking about market channels as places for brucellosis transmission reflected the changing reality of the beef production industry with more cattle spending time in large commercial feedlots and moving directly to nearby slaughterhouses.
Mark Friedberger, "Cattleman, Consumers, and Beef," *Environmental History Review* 18, no. 3 (1994): 55.
J. Richard Conner, Raymond A. Dietrich, and Gary W. Williams, *The U.S. Cattle and Beef Industry and the Environment*, (Texas Agricultural Market Research Center, 2000), 5 – 7, http://dels.nas.edu/resources/static-assets/banr/AnimalProductionMaterials/ConnerBeefEnvironment.pdf (accessed April 04, 2012).
National Brucellosis Technical Commission, *Report: National Brucellosis Technical Commission* (Washington, D.C.: Animal and Plant Health Inspection Service, United States Department of Agriculture, 1978), 4.3-1.

[7]"Bang's Eradication Goal Appears to Be Out of Reach," *Hoard's Dairyman* 118, no. 1 (1973): 47.

The ability to move cattle across state lines continued to be a weapon for the Department of Agriculture to use in maintaining state and industry involvement in the cooperative eradication program. This issue became a focal point as states decided if they wanted to transition from modified certified status to certified-free status or, in other words, if they wanted control or eradication. After Texas gained brucellosis modified certified status in 1973, range cattle owners and members of the Texas Veterinary Medical Association joined forces to question the value of eradication for the state due to the high cost and difficulty of reaching that goal. While they did agree that brucellosis control was advantageous, they asserted that the economic impact of the disease on beef cattle remained small and that large herd and ranch sizes in Texas made it difficult to comply with the federal program.[8] These arguments extended back to initial debates about a federal brucellosis control program after World War II, but instead of fighting against any brucellosis program, these cattle owners and veterinarians opposed a state eradication program. The one reason given for the state to proceed with an eradication program was the issue of interstate transportation. Range cattle owners worried about other states refusing to accept Texas cattle because the state stopped at modified certified status or lost its status by not complying with UMR changes and proceeding with an eradication program.[9] When a bill establishing regulations to achieve certified-free status came up for vote in 1973, the Texas and Southwestern Cattle Raisers Association, an organization long opposed to a federal eradication program, took no stance on the legislation due to a wide difference of opinions by members.[10] Many of their cattle owner members did not want to transition from a control program to an eradication, but the concern about the economic repercussions for rejecting the standards set by the federal arm of the program stopped them from objecting outright to state legislation.

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[8]"Joint Brucellosis Meeting Held," *The Cattleman* 59, no. 9 (1973): 144.
House Committee on Agriculture, *Brucellosis Eradication Program: Hearing Before the Subcommittee on Department Operations, Investigation, and Oversight*, 94th Cong., 2nd Sess., June 28, 29, 30, 1976, 214.
[9]"Joint Brucellosis Meeting Held," 144.
"Brucellosis: The Heat Is On," *The Cattleman* 59, no. 10 (1973): 22.
[10]"TSCRA Reports Legislative Activities," *The Cattleman* 60, no. 1 (1973): 32.

The bill passed in Texas and the start of the certified-free plan in the state once again demonstrated the cooperative nature of the brucellosis eradication program. Just as it had before, the USDA compromised with state animal health officials to gain industry and state support. The Department of Agriculture allowed Texas to start the certified-free effort later without losing its modified certified status and created a number of exceptions to the testing regulations including no testing at sale yards, no testing of any cattle under two unless reactors were found in the herd, and no testing of calves born to non-reacting cows in infected herds. In addition, the USDA let Texas split the state into two separate testing areas due to the large size of the state and the difference in cattle management across the state.[11] This effectively turned Texas into two different states, West Texas and East Texas, so that if West Texas achieved certified-free status long before East Texas, as had happened with modified certified status, cattle producers in that part of the state could receive the benefits of this status.

The Reemergence Of Brucellosis in Cattle and Humans

While Texas started on the path to certified-free status and 99% of all United States counties achieved certified status by 1974, the Accelerated Brucellosis Eradication Program still took a step backwards in its goal of eradicating brucellosis. It appeared as if the program continued to succeed based on the number of states and areas certified, but the details behind those numbers showed a different picture.

[11]"Animal Health Problem Reviewed," *The Cattleman* 60, no. 5 (1973): 28.

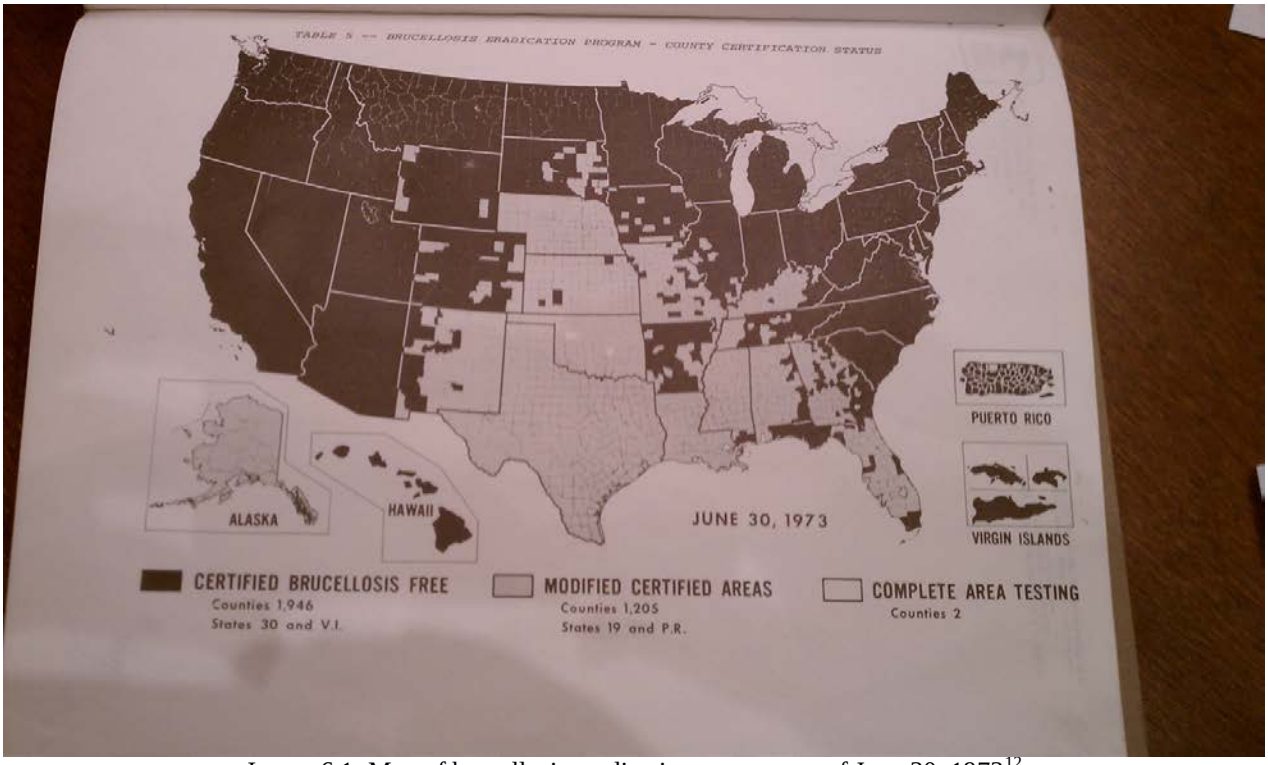

Image 6.1: Map of brucellosis eradication program as of June 30, 1973[12]

Only two counties in Oklahoma had not achieved modified certified or certified-free status by the end of fiscal year 1973, but that number tripled in the next year to include areas in East Texas and Missouri.[13] Even though only a small number of counties lost their certification status, other areas experienced problems with reinfection. Certified-free herds kept being reinfected by replacement cattle imported from regions or countries with brucellosis.[14] Since 1970, twenty states experienced an increase in the number of brucellosis infected herds and the overall prevalence of the disease increased by 8% in 1973.[15] While some states and areas had increasing incidence of the disease the percentage of

[12]United States Department of Agriculture, "Cooperative State-Federal Brucellosis Eradication Program, Statistical Tables of Fiscal Year 1973," *Cooperative State-Federal Brucellosis Eradication Program, Statistical Tables of Fiscal Year* (1973): Table 5.

[13]Ibid., Table 5.
United States Department of Agriculture, "Cooperative State-Federal Brucellosis Eradication Program, Statistical Tables of Fiscal Year 1974," *Cooperative State-Federal Brucellosis Eradication Program, Statistical Tables of Fiscal Year* (1974): Table 6.

[14]"When Will Brucellosis Be Eradicated," *Hoard's Dairyman* 119, no. 10 (1974): 669.
Department of Food and Agriculture of the State of California, "Media Release (Dec 11, 1973)," MD 83/45c Carton 7, Folder Brucellosis, The Bancroft Library, University of California Berkeley.

[15]"Sitting on a Powder Keg," *Hoard's Dairyman* 119, no. 5 (1974): 312.
"Speaking Out . . . New York Official Opposes Routine Calfhood Vaccination," *Hoard's Dairyman* 119, no. 13 (1974): 815.

infected cattle did not increase enough to cause them to lose their brucellosis program status. The increase in infection overall led animal health officials to reevaluate their date for total brucellosis eradication and move it from the end of 1975 to 1981.[16] This new eradication date reflected the difficulties states with high rates of infection, especially in the South, experienced when trying to eradicate brucellosis.

The increase in cases of bovine brucellosis corresponded with an increase in human brucellosis cases. For the first time since 1968, the number of reported cases of undulant fever increased in 1974 to 246 cases.[17] Occupational incidence still accounted for the majority of cases with swine being the suspected cause in 38% of investigated cases and cattle being the suspected cause in 28% of investigated cases.[18] During the following year, the number of reported human brucellosis cases rose to 328 cases and for the first time since 1959, cattle was suspected as the cause in more cases than swine. The number of cases caused by *Brucella abortus* had been increasing since 1972, but 1975 marked the first time it had surpassed *Brucella suis* as the main cause of infection since the late 1950s.[19] This rise of undulant fever cases caused by cattle reiterated the importance of eradicating the disease in animal reservoirs in order to eliminate infection in humans. Human cases could be treated with antibiotics and only a few cases resulted in death each year, but no significant public health intervention existed for occupational cases outside of eradication of brucellosis in animals.

The increase of human and bovine brucellosis cases in fiscal year 1973 and again in 1974

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[16]"When Will Brucellosis Be Eradicated," 669.

[17]Center for Disease Control, "CDC Brucellosis Surveillance, Annual Summary – 1974," *Brucellosis Surveillance, Annual Summary* (1975): 1.

[18]Several different occupation faced brucellosis infection as a workplace disease. The majority of cases occurred in packinghouse workers (46% of investigated cases) and livestock producers (21% of investigated cases), but veterinarians and medical researchers who worked with the disease or the vaccine also risked infection. These animal health workers accounted for 5% of investigated infections in 1974.
Ibid., 4-6.

[19]Center for Disease Control, "CDC Brucellosis Surveillance, Annual Summary – 1975," *Brucellosis Surveillance, Annual Summary* (1976): 1.
"Human Brucellosis Tops 300 Cases in 1975," *Hoard's Dairyman* 121, no. 21 (1976): 1255.

galvanized the USDA's effort to eradicate the disease after five years of focusing on other animal disease problems. During the late 1960s and early 1970s, the USDA shifted focus and funding from the Accelerated Brucellosis Eradication Program to other disease eradication programs since brucellosis eradication seemed near.[20] Funding moved to programs for diseases and parasites that seemed more problematic for livestock producers including hog cholera, Newcastle disease, and screwworm.[21] With more cattle entering the program, the stagnant brucellosis budget had to cover the cost of more testing, staff, and indemnity payouts. One state brucellosis epidemiologist noted that the lack of funds made it difficult to trace back cattle that tested positive in market cattle testing or to track exposed cattle to ensure they went to the slaughterhouse. Many epidemiologists and veterinarians working for the eradication program felt as if the program existed in limbo.[22] The laws and regulations for eradication existed, but the lack of funds made it impossible to enforce them. In addition to operational funding shortfalls, the $3.2 million put aside each year for federal indemnity fell short of covering the cost of reactor cattle sent to slaughter.[23] Adding additional cattle to the number of animals eligible for slaughter and indemnity by branding cattle exposed to reactors in market channels stretched the indemnity budget even further causing the USDA to reduce the maximum payouts in December 1974 in order to avoid exhausting indemnity funds halfway through the fiscal year.[24] Even with the effort to stretch the budget for the program to cover the fiscal year, the Department of Agriculture had to allot another $5 million dollars to keep all the parts of the program in operation in fiscal year 1975.[25] Some cattle owners, veterinarians, and animal health officials worried that the loss of focus and lack of adequate funding threatened the success of the eradication program, and they encouraged the newly formed Animal and Plant Health Inspection Service (APHIS) to increase focus on brucellosis infection

[20]C.N. Dobbins Jr., "Urges Bang's Protection in Southern Herds," *Hoard's Dairyman* 119, no. 18 (1974): 1097.
[21]"Brucellosis Is Next," *Hoard's Dairyman* 120, no. 3 (1975): 187.
[22]Paul W. Horn, "Brucellosis," *The Cattleman* 62, no. 3 (1975): 75-78.
[23]"Bang's Eradication Goal Appears to Be Out of Reach," 47.
[24]"Brucellosis Indemnity Limits For Cattle Reduced by USDA," *The Cattleman* 61, no. 7 (1974): 32.
[25]"Brucellosis Program Receives Adequate Funds for Fiscal Year 1975," *The Cattleman* 61, no. 9 (1975): 24.

and review the eradication goals and program in order to achieve the desired goal.[26]

Perceived Problems With The Current Brucellosis Eradication Program

The rise in the number of bovine brucellosis cases highlighted the growing divide of opinion on eradication or control between the dairy industry and the beef cattle industry, echoing the structure of the debate over the creation of the state-federal brucellosis control program after World War II. Most dairy cattle herds achieved brucellosis eradication by 1970, but the introduction of infected cattle from replacement cattle kept occurring.[27] Most dairy cattle owners and veterinarians blamed both the USDA and areas with high prevalence of the disease for reinfection of certified-free herds. One policy that received much criticism was the Department of Agriculture's decision to stop funding vaccinations and deemphasizing the vaccine in disease-free areas. Without vaccination or natural occurrence of the disease, cattle in infection-free herds had no natural immunity against brucellosis. The entire herd faced infection when exposed to cattle with brucellosis since no members of the herd had immunity.[28] Even though the strain 19 vaccine provided full immunity for only two thirds to three quarters of a herd, this rate of immunity prevented the disease from devastating a herd. Some animals may contract the disease, but the majority would be spared. When no animals in a herd had immunological defenses against brucellosis, the reintroduction of the disease to a herd became potentially more damaging since all

[26]The USDA created the Animal and Plant Health Inspection Service in October 1971. When the Department of Agriculture formed the Agricultural Research Service (ARS) in 1953, it folded the Bureau of Animal Industry into the new research arm of the department. ARS covered all research done by the USDA. During the Nixon administration, the President called for the elimination of the Department of Agriculture, but instead a review of its functions occurred. As a result, some of the USDA's responsibilities moved to other federal agencies and officials separated out animal and plant health monitoring to its own research agency within the Department of Agriculture. The federal brucellosis eradication program along with other disease eradication efforts became the responsibility of the Animal and Plant Health Inspection Service for the rest of the twentieth century.
Wayne D. Rasmussen and Gladys L. Baker, *The Department of Agriculture* (New York: Praeger Publishers, 1972), 241.
Wayne Rasmussen, "The People's Department," in *The United States Department of Agriculture in Historical Perspective*, ed. Alan I Marcus and Richard Lowitt (Washington, D.C.: Agricultural History Society, 1991), 297.

[27]House Committee on Agriculture, *Brucellosis Outbreak in New York and Vermont: Hearing Before the Subcommittee on Department Investigations, Oversight, and Research*, 95th Cong., 1st sess., September 30, 177 and October 1, 1977, 28.

[28]Clyde D. Lyle, "Brucellosis Continues to be a Major Concern," *Hoard's Dairyman* 119, no. 13 (1974): 822-823.

cattle could develop into reactors. If all cattle tested positive, the entire herd had to be depopulated and built from scratch rather than just replacing a few animals.[29] Most dairy cattle owners, industry groups, and veterinarians wanted the Department of Agriculture to reverse its vaccination policy and restart vaccination of all female calves in order to provide some immunity to certified-free herds.

While the policy to decrease vaccination in certified-free areas received blame for the increase of the disease across the nation from many in the dairy industry and veterinarians working in dairy producing areas, they also blamed aspects of the eradication program that allowed for the continued spread of brucellosis including the movement of infected animals into certified-free areas. They critiqued the Department of Agriculture and state animal health officials for not adopting the UMR in all states, being too lax in enforcing existing testing and other program policy, taking too long to trace back infections detected by BRT or MCT, and allowing cattle in the market channels to be sold back to cattle owners without testing.[30] These policies allowed diseased cattle to enter certified-free areas and threatened the health of dairy cattle herds in areas with modified certified status. Federal and state program administrators did not receive all the blame. Dairy cattle owners also complained about some beef producers who "have used every loophole, plus various methods of deceit, for their own personal gain."[31] The beef producers who took advantage of testing and sales loopholes or falsified records to transport cattle or avoid herd testing compounded the programmatic problems in the eyes of most of the dairy industry. This critique of beef producers fit into the larger perception in the dairy industry that high prevalence states, mainly in the South, had to put forth more effort to control the disease in their region in order to prevent the spread of the disease across the country.[32] The states with the highest prevalence of disease were southern states along the Gulf Coast along with Georgia, Tennessee,

[29]House Committee on Agriculture, *Brucellosis Outbreak in New York and Vermont*, 13, 42, 50, 74.
[30]"When Will Brucellosis Be Eradicated," 669.
[31]Dobbins, 1095.
[32]"When Will Brucellosis Be Eradicated," 669.

Oklahoma, and Kentucky. 90% of all reported infected herds existed in the eleven states during fiscal year 1975 and only Kentucky had actively tried to reduce the number of infected herds over the last few years.[33] Despite some of their cattle owners preferring brucellosis control by vaccination, modified certified states usually had lower rates of vaccination too, with only 14.6% of all eligible calves vaccinated in 1975.[34] These states contained 40% of the nation's beef cattle and only 16% of the its dairy cattle though they provided a larger number of replacement cattle and feeder calves to the rest of the country including dairy herds. Since these states had a larger percentage of beef cattle than dairy cattle, many in the dairy industry perceived the beef industry as an obstacle to eradication.[35] This perception only heightened the already existing rift between the two parts of the cattle industry and between cattle owners in different areas of the country.

Most of the dairy industry wanted more uniform brucellosis eradication policy along with stricter enforcement of existing policy and new regulations that would prevent the spread of brucellosis. Rhetorically, the industry focused not on the health or agricultural economic impact of the infection, but rather the monetary commitment already made to the program to justify continuing pushing for eradication. They warned that settling for control rather than eradication risked wasting the hundreds of millions already spent on the federal brucellosis eradication program.[36] Since the program had already achieved eradication in so many areas for so much money, it made more sense financially to continue the campaign for eradication. While the dairy industry used this monetary argument to advocate for eradication, parts of the beef industry utilized the same financial figures to oppose eradication and campaign for a control program. Some beef cattle industry groups argued that after 20 years and $750

[33]National Research Council Subcommittee on Brucellosis Research, *Brucellosis Research: An Evaluation: A Report of the Subcommittee on Brucellosis Research, Committee on Animal Health, Board on Agriculture and Renewable Resources, National Research Council* (Washington, D.C.: National Academy of Sciences, 1977), 3.
[34]Ibid., 5.
[35]"Brucellosis Program Receives Adequate Funds for Fiscal Year 1975," 24.
"When Will Brucellosis Be Eradicated," 669.
[36]"Sitting on a Powder Keg," 312.
House Committee on Agriculture, *Brucellosis Eradication Program*, 4, 24, 66.

million spent on the part of cattle owners, states, and the federal government, the state-federal brucellosis eradication cooperative had not eradicated brucellosis and never could achieve this goal. They thought that if the program continued towards the goal to eradicate the disease, it would just waste more money without any possibility of success.[37] Instead of funding an eradication program based on testing, they wanted a control program based on vaccination, which would cost less each year than an eradication program.[38] As discussed in chapters three, four, and five, vaccination had always been the preferred method of brucellosis control for range and beef cattle owners, but previously those who favored vaccine programs thought that they could lead to eradication instead of test and slaughter. The knowledge that the vaccine provided full immunity for only a percentage of vaccinated cattle meant that proponents of a vaccination program in the 1970s had to advocate for control and not eradication.

The beef cattle owners who supported control through vaccination used not only the cost of the program and lack of success as justification for a vaccine based program, but also compared brucellosis to human diseases and public health intervention strategies for human diseases. These cattle owners compared brucellosis to the common cold, impossible to eradicate so control became the next best option.[39] They also associated the control of brucellosis through vaccination to human diseases controlled through vaccination in order to encourage the development of more effective bovine brucellosis vaccines. The recent success of the polio vaccine and the near eradication of smallpox

[37]"TSCRA Convention a Success," *The Cattleman* 60, no. 11 (1974): 134.

[38]The majority of dairy cattle owners and veterinarians also wanted vaccinations for calves, just as part of an eradication program not a control program. At a 1975 USAHA meeting, dairy farmer representatives unanimously supported the use of strain 19 vaccine in any eradication program and the Animal Health Association asked that the Secretary of Agriculture include a statement favoring the continued use of strain 19 vaccine in any future eradication programs.
"Hilmar Moore Testifies Against Brucellosis Eradication Funding," *The Cattleman* 60, no. 12 (1974): 23.
House Committee on Agriculture, *Brucellosis Eradication Program*, 51.
"Move to Limit Strain 19 Finally Rejected," *Hoard's Dairyman* 120, no. 23 (1975): 1347.

[39]"Hilmar Moore Testifies Against Brucellosis Eradication Funding," 110.

through vaccination demonstrated the potential effectiveness of vaccine based eradication programs.[40] Many range cattle owners and beef producers in high prevalence areas encouraged the development of a more effective brucellosis vaccine that could lead to an eradication program. Those who compared brucellosis control to control for human diseases also used the rhetoric to question the value of slaughtering cattle.[41] During a congressional hearing on the brucellosis program in Florida, the head of one local cattleman's association implored "when we had polio, we did not kill the kids. We went out and found something to vaccinate these children with and we think that this ought to be done with the brucellosis program."[42] By paralleling brucellosis to human diseases rather than other animal diseases, these cattlemen attempted to reframe the way other cattle owners and animal health officials thought of the disease and its control. As discussed in chapter one, animal disease control shared many intervention and research strategies with human public health. One of the main differences between public health in the two populations was the option to slaughter animals to prevent the spread of a disease. In the past, brucellosis control had always been compared to other animal disease control efforts like tuberculosis that included the slaughter of diseased animals. By associating the animal disease with human diseases instead and cattle with people instead of livestock, those who supported a control program hoped to eliminate the possibility of slaughter for control and prevention.[43] Instead of

[40]Senate Committee on Appropriations, *Brucellosis Eradication Program in Florida: Hearing Before a Subcommittee of the Committee on Appropriations*, 94th Cong., 2nd sess., 1976, 83.
House Committee on Agriculture, *Brucellosis Eradication Program*, 178-179.
[41]House Committee on Agriculture, *Brucellosis Eradication Program*, 178-179.
[42]Senate Committee on Appropriations, *Brucellosis Eradication Program in Florida*, 83.
[43]Beef cattle owners who wanted brucellosis control through vaccination focused on the recent success of human vaccines for polio and the success of the smallpox eradication program as a way to reframe the brucellosis debate away from test-and-slaughter, a standard tool used in animal disease eradication, and towards vaccination as used in human public health interventions. The association of animals with children and the desire to vaccinate calves rather than kill reactors was an extension of the tension between animal welfare and the agricultural industry that had existed since the colonial era. Many Americans, both consumers and producers, recognized the need for animal products and agriculture, but also wanted to prevent mistreatment or unnecessary harm of livestock. The dissenting beef producers tapped into this mindset by asserting that vaccination could prevent unnecessary slaughter of cattle for brucellosis. It saved animal lives even if those animals were designated for slaughter eventually. Killing these cattle for disease control when they could instead be vaccinated for protection constituted animal abuse while slaughter for meat production constituted a legitimate reason for livestock slaughter.

relying on standard animal disease control procedures, the supporters of a vaccine based control program hoped to utilize a human public health intervention as the method of control for brucellosis.

New Regulations For Eradication

While many beef cattle owners in southern states demanded an end to eradication efforts and the start of a control program based on vaccination, the USDA decided to continue forward with the eradication program. Dr. Paul Becton, the newly appointed head of APHIS brucellosis eradication program, and other APHIS officials argued that 99% of cattle in the country were brucellosis-free and that the eradication program had to continue to protect these animals.[44] The disease had become an epizootic threat to almost all American cattle and federal animal health officials wanted to eliminate the potential health and economic consequences of brucellosis reemerging in herds with no natural or vaccine induced immunity. The increased incidence of the disease and the failure to meet the expected goal of eradication by the mid-1970s renewed interest in the brucellosis program on the federal level as the Department of Agriculture recommitted itself to eradicate it in domestic cattle.

In order to finally achieve the goal of eradication and prevent the reintroduction of brucellosis into certified-free areas, the USDA proposed tighter shipping rules again and expanded the definition of potentially condemned cattle. They made almost 30 major changes to brucellosis related rules in the federal regulations that regulated the interstate shipment of cattle in April 1975 and proposed more

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There had been successful vaccines for other animal diseases like blackleg and anthrax that effectively worked to control the diseases in the United States. However, these vaccines provided near 100% immunity, the diseases were easily diagnosed, and the infected animal either died or recovered without being a carrier for the disease in a short period of time unlike in cases of bovine brucellosis. In the case of epizootic episodes of blackleg and anthrax, all infected animals were quarantined until they were either dead or recovered.
Susan D. Jones, *Valuing Animals: Veterinarians and Their Patients in Modern America*, (Baltimore: Johns Hopkins University Press, 2003), 141 – 154.
United States Department of Agriculture, Animal and Plant Health Inspection Service, Veterinary Service, Epizootiology and Ecology of Anthrax, (2006) http://www.aphis.usda.gov/animal_health/emergingissues/downloads/anthrax.pdf (accessed April 05, 2012).

[44]New Rules Adopted by USDA for Brucellosis Eradication Goal," *The Cattleman* 62, no. 1 (1975): 23.
"Brucellosis Is Next," 187.
House Committee on Agriculture, *Brucellosis Eradication Program,* 4.

changes to the recommended Uniform Method and Rules for state programs. These proposed revisions clarified definitions and built on the steps taken a few years earlier to close any loopholes in the system that allowed diseased cattle back into the general cattle population including the new expanded markets channels that arose due to increase feedlot use and the practice of pen hookers who bought and sold cattle outside of auction barns.[45] The new regulations required that all cattle older than six months coming from non-certified herds be tested immediately before or after being sold at the first point of concentration and that any exposed cattle be heat branded with an "S" on the jaw.[46] This designated these exposed cattle as sold for slaughter only or return to the originating herd under quarantine until the full herd had two negative agglutination tests.[47] The highly visible marking was created to ensure brucellosis reacting cattle went to slaughter and were not sold to a disease-free herd, addressing the concern of many certified-free cattle owners who worried about reinfection from replacement cattle.

While these changes to the Code of Federal Regulations and the UMR pleased cattle owners and animal disease control officers at the Department of Agriculture who sought prevention against reinfection of clean herds, many range cattle owners in non-certified-free areas and states opposed the revisions to the brucellosis eradication program regulations. During a meeting of the Texas Animal Health Commission, range cattle owners identified two of the new rules that concerned them the most.[48] The first was the new definition of a "herd". Large ranches often maintained many different groups of cattle in different areas of a single ranch. Under the old definition, each individual group was a herd and even if one herd on a ranch faced quarantine due to market cattle testing, the other herds did not fall under quarantine. Some cattle ranchers worried that under the new definition of a herd, their entire ranch including cattle in other groups and areas could be considered a herd and placed under

[45]House Committee on Agriculture, *Brucellosis Eradication Program*, 65.
[46]"Tighter Shipping Rules to Fight Brucellosis," *Hoard's Dairyman* 119, no. 20 (1974): 1215.
[47]"New Rules Adopted by USDA for Brucellosis Eradication Goal," 23.
[48]"Major Revisions of Brucellosis Program Cause Concern," *The Cattleman* 62, no. 3 (1975): 46.

quarantine. They also worried about the new "S" branding regulations that included branding an exposed cattle. Combined with the change earlier in the decade to consider any cattle that spent more than 24 hours with a reactor cow as exposed, this meant that any cattle that traveled with a reactor animal or spent time in a market or feedlot with a reactor could be condemned to slaughter despite a negative test for brucellosis. Some range cattle owners worried that new regulation of "S" branding exposed, but non-reacting, cattle could be interpreted as "confiscation of property without due process" and that "all of these loose interpretations will need to be studied at the hearings."[49] The lack of certainty about the interpretation of the new regulations for brucellosis eradication raised the specter of more lawsuits like the one R.J. Nunley brought against the Texas Animal Health Commission earlier in the decade. Cattle owners could start raising questions again about the validity of the brucellosis eradication program as a police power of the state and claim that the state was depriving them of their property through an invalid process.

As the guidelines for regulation in each state, the changes to the Uniform Method and Rules had to be voted into law in each individual state. In the past, the Department of Agriculture had allowed for some flexibility in each state's program regulations to work with the cattle owners and gain the support for the brucellosis eradication program among them. As part of the new drive to eradicate brucellosis once and for all, Animal and Plant Health Inspection Service officials changed the UMR from being recommended to mandatory as the baseline requirements for a state's brucellosis eradication program.[50] By adopting changes to the Code of Federal Regulations , APHIS guaranteed that any cattle being shipped interstate complied with the new rules too.[51] This change shifted the nature of the state-federal cooperative program. Before, the program truly originated in the demands of the cattle industry and veterinarians. The United States Animal Health Association and National Brucellosis Committee

[49]Ibid., 46.
[50]National Research Council, *Appendix: The Recommended Uniform Method and Rules*, 1.
[51]"Shipping Rules Tightened to Fight Bang's," *Hoard's Dairyman* 120, no. 13 (1975): 805.

negotiated these demands, suggesting brucellosis eradication program details to the federal government. The Department of Agriculture usually adopted these industry suggestions with little debate or change. These ideas then were modified by states to suit the needs and demands of their cattle owners and cattle owners had to opt into the program. The program and the power to change and enforce the related regulations really laid in the hands of cattle owners. By mandating that states implement changes to the UMR that addressed prevention of reinfection, the federal government ignored the demands of many Gulf Coast cattle producers and prevented states from modifying their own brucellosis programs. Before the brucellosis eradication program was a bottom up program, but the decision from APHIS to protect the 99% of disease-free cattle and prevent reinfection by mandating stricter policy changed it to a top-down program with the Department of Agriculture forcing all states to comply with its regulations and all cattle owners to participate when they leased or sold cattle.

Federal Power And The Texas Brucellosis Eradication Program

Many states adopted the new regulations, but in September 1975 the Texas Animal Health Commission rejected the changes to the state brucellosis eradication program by a 5 to 3 vote.[52] Composed of appointed representatives from the state livestock industries and veterinary

[52]Like many states, Texas had established an animal disease control commission around the same time as the establishment of the Bureau of Animal Industry. Originally created to eradicate tick fever the committee had three members, all members of the cattle raising industry, appointed for a two year term by the governor. The state legislature expanded the charge of the commission to include other livestock diseases like brucellosis in 1955 and expanded the number of commissioners to include a veterinarian and representatives from the poultry and swine raisers community and it expanded further in the 1970s to include a representative from the growing feedlot industry for a total of nine members by 1973. The commissioners who ruled on the changes to the state brucellosis eradication program in 1975 had been appointed by Governor Dolph Briscoe, a former president of the Texas and Southwestern Cattle Raisers Association. At the time of debate over the proposed changes to the state program, it was believed that Governor Briscoe, one of the state's largest cattle owners, had four herds under quarantine for brucellosis.
See Chapter 5, footnote 140 for more information on Governor Briscoe.
"Brucellosis Changes Rejected," *The Cattleman* 62, no. 5 (1975): 21.
"Texas Standard Not Changed," *Dallas Morning News*, September 08, 1975, 7.
Texas Archival Resources Online, "Texas Animal Health Commission: An Inventory of Animal Health Commission Meeting Records at the Texas State Archives, 1962-2000," http://www.lib.utexas.edu/taro/tslac/10193/tsl-10193.html (accessed April 07, 2012).

medicine, the commission members heard arguments for seven hours from about 100 people including association spokesmen and individual cattle owners before voting against the new regulations. The Texas and Southwestern Cattle Raisers Association led the charge against the changes that would require the testing of all cattle except calves under six months from certified-free dams, spayed heifers, and steers before change of ownership or leasing of cattle, the branding of exposed cattle, and the separation of uninfected cattle from infected, exposed, and cattle of unknown status at market. The organization claimed that the proposed regulations were too expensive since all cattle branded with an "S" had to be sent to slaughter and not quarantined for practical reasons. With the strain on indemnity funding discussed earlier in the chapter, cattle owners thought they did not get fair value for exposed cattle and stood to lose substantial amounts of money.[53] The Texas Livestock Markets Association, a professional organization representing livestock buyers, auctioneers, and dealers, also wanted the TAHC to reject the proposed changes and asked for a study of how to best control the disease. Like the TSCRA, the group also worried about the branding of exposed, but non-reacting cattle and the difficulty and cost of separating and quarantining of exposed cattle at market. They viewed the policy based on economic terms not health terms and asked the commission to "view competitive marketplaces as marketplaces and not as veterinary clinics."[54] Other local cattle raising organizations endorsed the TSCRA position as did a large number of the individual cattle owners who spoke at the hearing.[55] The argument against the proposed changes boiled down to an economic argument. Cattle owners opposed to the plan thought that complying with the program cost more than enzootic brucellosis infection in their cattle.

While most Texas based range cattle organizations and farmers opposed the adoption of new

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"State of Texas Under Bang's Quarantine," *Hoard's Dairyman* 121, no. 1 (1976): 55.
[53]"Brucellosis Changes Rejected," 21.
[54]Ibid., 21.
[55]Ibid., 21
"Brucellosis Changes Draw Protests," *Dallas Morning News*, September 07, 1975, 30.

regulations, the state's dairy and farm groups supported the brucellosis eradication effort. Both the Texas Farm Bureau and the Associated Milk Producers, Inc. (AMPI) spoke in favor of conforming to the new Uniform Methods and Rules and some of their members also spoke for the new program rules. Some of the Texas Animal Health Commission members wanted to vote in the proposed changes, but the nays carried the day with the group's chairman Norman Moser, a former Texas and Southwestern Cattle Raisers Association president, leading the opposition against the bill.[56]

A month later in response to the rejection of the now mandatory UMR changes, the Department of Agriculture threatened to place Texas cattle under a federal quarantine as of January 1976 and drop the state from the cooperative eradication program. This meant that all counties would lose their modified or certified-free status and that all cattle leaving the state would have to be tested for brucellosis and face quarantine once arriving at their new herd.[57] These restrictions would make Texas cattle less desirable than replacement cattle from brucellosis program participating states due to the cost of testing and quarantine and would make dairy products harder to sell since many areas required that all dairy came from certified-free herds. The use of the threat of quarantine was the only recourse the Department of Agriculture had to make states comply with the rules of the federal brucellosis eradication program. This actual quarantine differed from the de facto quarantine that new regulations would have created in the 1960s as discussed in the previous chapter. The earlier potential de facto quarantine established by stricter interstate shipment laws, allowed cattle in certified-free herds or certified-free areas to be shipped without testing and did not remove the state or area from the program. That type of legislated quarantine focused on individual cattle owners to encourage them to enter their herds into the eradication program and get rid of the disease. The actual quarantine that would start in 1976 aimed to force the state brucellosis program into compliance with the federal rules. By pulling all

[56]"Brucellosis Changes Rejected," 21.
[57]"USDA Threatens Quarantine, Withdrawal of Federal Funds," *The Cattleman* 62, no. 6 (1975): 24.

funding and requiring all cattle to be tested, the impending quarantine went farther than the previous de facto quarantine policy.

By placing the state of Texas under a quarantine, both the state and the country faced a potential economic and health crisis. According to the USDA agricultural census in 1974, Texas had almost 13.4 million cattle on 138,563 farms across the state, accounting for 11.8% of all the cattle in the United States.[58] Cattle owners in the state generated over $2.6 billion in cattle sales and over $237 million in dairy product sales in 1974.[59] Cattle was big business for the Texas economy and the United States economy. The sale of cattle in Texas alone accounted for 14.5% of all cattle sales value in the United States and the sale of cattle in the United States accounted for $18 billion or 1/5 of the entire value of crops and livestock sold in the country. A decrease in sales from Texas could greatly impact the entire country's agricultural economy.[60] The potential quarantine jeopardized the livelihood of many farmers in the state and affected those in other states as well. Cattle owners across the country, including dairy cattle owners, bought feeder calves, purebred cattle, and replacement cattle from Texas.[61] Without easy access to the millions of heads of cattle in the state, cattle owners in other states faced a shortage of replacement cattle for their own dairy or beef herds. Texas cattle could in theory still be purchased by cattle owners in other states, but it would have to be tested, found to be brucellosis-free, and then quarantined and retested when they arrived at their new herd. This created a significant barrier to the purchase of Texas cattle, most likely reducing the number and value of cattle sales. Without access to

[58]United States Bureau of the Census, *1974 Census of Agriculture*, (Washington D.C.: United States Department of Commerce, Bureau of the Census, 1977) http://usda.mannlib.cornell.edu/usda/AgCensusImages/1974/01/43/306/Table-12.pdf (accessed April 07, 2012), Part 1.
United States Bureau of the Census, http://usda.mannlib.cornell.edu/usda/AgCensusImages/1974/01/51/313/Table-12.pdf (accessed April 07, 2012), Part 1.
[59]United States Bureau of the Census, *1974 Census of Agriculture*, (Washington D.C.: United States Department of Commerce, Bureau of the Census, 1977) http://usda.mannlib.cornell.edu/usda/AgCensusImages/1974/01/43/305/Table-31.pdf (accessed April 07, 2012), Table 31.
[60]Ibid., Table 31.
National Brucellosis Technical Commission, *Report: National Brucellosis Technical Commission*, 4.2-1.
[61]"TSCRA Files Suit Against USDA," *The Cattleman* 62, no. 8 (1976): 21.

replacement and sale cattle, beef producers, breeders, and dairies also faced potentially smaller profits, impacting the agriculture economy of Texas and the United States.

The USDA also planned to withdraw $1.35 million dollars in funding for the brucellosis program in Texas as part of the quarantine. This accounted for 70% of the state's brucellosis eradication funding and $1 million of the money went to indemnity alone. The federal eradication program planned to leave its federal officials in the state, but only to monitor the rate of infection. Federal officials would no longer assist the state eradication effort and federal laboratories would no longer run tests for the state program.[62] Not only would Texas have to make up over a million dollars in funding to keep the brucellosis eradication program at its 1975 current funding level, but the Texas Animal Health Commission would also have to make up the staffing and laboratory deficits. Without this federal funding and staffing, Texas would be unlikely to be able to afford to keep its existing brucellosis program in place. As a result, the disease could spread to brucellosis-free herds in the state leading to even fewer cattle eligible to be exported after testing and potentially leading to more cases in other states. Cattle often flowed between states on the northern and eastern border in areas with a high density of cattle. Even with a quarantine, diseased cattle could be shipped between these states by truck on highways or farm roads.[63] Without inspections and roadblocks on every road, diseased cattle could be illegally shipped out of the state and threaten the brucellosis eradication program in other states. The federal quarantine and withdrawal of Texas from the state-federal brucellosis eradication cooperative would likely lead to more cases of bovine brucellosis and decreased cattle sales and dairy sales in the state and potentially could have impacted the agricultural economies and brucellosis eradication efforts in other states.

In response to the APHIS's action, two different cattle producer organizations sued to prevent

[62]"State of Texas Under Bang's Quarantine," 55.
[63]National Brucellosis Technical Commission, *Report: National Brucellosis Technical Commission*, 4.8-4 – 4.8-5.

the quarantine from starting on January 1, 1976. Both the Texas and Southwestern Cattle Raisers Association and the American Milk Producers, Inc. had lobbied at the initial Texas Animal Health Commission meeting when the commission member voted against the proposed changes from the UMR. The TSCRA, representing many of the state's range cattle owners including the governor and members of the TAHC, was the primary organizer of the campaign against changing the state brucellosis regulations while the AMPI, a dairy marketing collective representing many of the state's dairy cattle owners, argued for complying with the changes to the Uniform Methods and Rules.[64] This once again highlighted the differences between many range and dairy cattle owners and how they wanted to manage brucellosis infection. Range cattle owners in Texas tended to prefer optional vaccination and herd management to control the disease while dairy cattle owners in the state tended to want eradication of the disease through mandatory test-and-slaughter, quarantine, and vaccination. These general industry opinions had been in place since the beginning of the federal brucellosis program and seemed to emerge as points of argument when the program underwent major changes to the federal rules and regulations.

The targets of each lawsuit demonstrated this difference in desire for brucellosis control or eradication. The TSWCRA sued the Department of Agriculture for an injunction to prevent the quarantine and the end of federal funding for the state brucellosis program. The organization claimed the USDA never filed an environmental assessment as required by the National Environmental Policy Act on how a quarantine would affect the state. The quarantine would increase the number of cattle in the state since they could not be exported and that increase in cattle would adversely affect the human environment enough to qualify as needing an assessment under the 1969 act. A judge granted a temporary injunction in December until the merits of the case could be heard, giving Texas a short

[64]"Brucellosis Changes Rejected," 21.

reprieve from the threat of a cattle quarantine.[65] While the TSWCRA lawsuit began moving its way through the court system, the AMPI filed a class action suit on behalf of its Texas members against all but two of the members of the Texas Animal Health Commission.[66] They also wanted to prevent the quarantine, but they wanted to do it by adopting the federal regulations instead of rejecting them and knocking down the quarantine on technical grounds like the TSWCRA. Once the judge heard the AMPI case, he decided in the favor of the dairy farmers by ordering the TAHC to adopt the UMR changes. The commission met in February to discuss the changes and a public hearing was held in March. Governor Briscoe then had to sign off on the changes, but he never did since he did not approve of them. Instead, the TAHC just operated as if the changes to the state plan had been approved due to the threat of quarantine by the USDA and another lawsuit by the AMPI.[67] The strategy of quarantine ultimately worked to force Texas to comply with the new federal brucellosis eradication program policy though it was through a lawsuit forcing this compliance. Those in the state who opposed the new regulation, including most of the members of the TAHC, the governor, and many range cattle owners, still opposed the federal brucellosis eradication policy and continued to fight for a control policy instead of eradication for the state.

The Development Of The National Brucellosis Technical Commission

When the Texas Animal Health Commission held its hearing on the changes to the state brucellosis regulations, both the Texas and Southwestern Cattle Raisers Association and the Texas Livestock Markets Association requested that Congress authorize a non-biased team to conduct a

[65]"TSCRA Files Suit Against USDA," 21.
[66]"AMPI Halts Texas Bang's Quarantine with Injunction," *Hoard's Dairyman* 121 no. 3 (1976): 194.
[67]Ibid., 194.
"Panel Explains 'Duress' Action," *Dallas Morning News*, April 17, 1976, 8.

feasibility study for the federal brucellosis eradication program.[68] The previous year Congress had authorized a similar study for APHIS's screwworm eradication program and now many of the cattle raisers who contributed to that study wanted to see the same process of assessment for the brucellosis program. Members of the TSCRA felt that a federal level study could determine how to best control or eliminate brucellosis in a cost efficient method that integrated the latest science and research.

This request for a program study also followed a course of action set out in the Texas Tech evaluation of the brucellosis eradication program commissioned by the TSCRA in the late 1960s. That study concluded that "'brucellosis is a serious disease of cattle and other farm animals. Cattlemen are vitally interested in a control or eradication procedure that is *sound, and fair under all aspects of application*.'"[69] The chief complaint of the dissenting cattle owners and producers in Texas was that the current federal brucellosis eradication program was not sound or fair because it had changed little since its initial establishment over 20 years earlier. The organization desired a comprehensive study of the current program to assess how to best control or eradicate the disease and to prove scientifically that the program was undertaking the best possible course of action. The TSCRA wanted the USDA to spend more time and money promoting vaccination and improving the vaccine to provide better immunity in order to reduce the number of nonparticipating cattle owners. They thought that a comprehensive study would show that this method was the way to achieve brucellosis control and with a better vaccine, eradication, rather than the current method of test-and-slaughter or quarantine.[70] Just as they had in the previous decade, the group wanted to use scientific evidence to demonstrate that their idea of brucellosis control through vaccination was the best possible plan for the nation. The Texas and Southwestern Cattle Raiser Association claimed that they did not want cattle owners to take their opinion to be accepted as fact. What we do

[68]"Brucellosis Changes Rejected," 21.
[69]"Cattle Raisers Call For Brucellosis Investigation," *The Cattleman* 62 no. 6 (1975): 22.
[70]Ibid., 23

> ask is that the possibility be accepted that the present USDA Brucellosis Eradication Program may be founded on questionable scientific and social axioms. To ascertain whether this present program is sound and workable or whether an alternate program is more feasible, we believe that an unbiased team of reliable scientists, not associated with the program, should thoroughly investigate all facets of this disease and combating efforts, and, thereafter, recommend a course of action.[71]

The request for the study demonstrates the reliance on proof through scientific study and that the organization did not trust scientists from the Department of Agriculture to be non-biased in this effort. The TSCRA thought that the best way to convince cattle owners and the government that the current program was deficient and a new one was needed was through a rigorous study rather than through legal channels or calling on cattle raisers to change the system through political action. This need for scientific evidence as the underpinning proof that a particular animal disease control program best served the needs of the nation had its roots in the original intent of the Department of Agriculture and the acceptance of scientific agriculture as a solution to animal disease problems as discussed in Chapter one and two. The reliance on science and the scientific method and the belief that science was the best tool to improve agriculture and determine the best agricultural methods still remained a cornerstone of both the USDA and the majority of the cattle industry.

Though the TSCRA wanted an unbiased feasibility study to determine the current problems with the brucellosis eradication program and the best solution to them, they already identified potential roadblocks to eradication in Texas that they wanted the study committee to investigate. One roadblock was wild reservoirs of the disease that potentially reinfected brucellosis-free herds. This included wild game such as bison and elk along with wild cattle. As discussed in the first chapter, cattle had colonized Texas and other states on the Gulf Cost long before European settlers and their populations were

[71]Ibid., 24.

enormous. While many of those animals had been rounded up by settlers in the nineteenth century, a small number of them still roamed wild through the brush and swamp, serving as an unvaccinated reservoir for brucellosis.[72] They were also concerned about another reservoir for the disease, careless cattle owners who would not vaccinate their cattle to control the disease. Though the TSCRA fought against a federal brucellosis eradication program, they advocated for personal responsibility and good herd management to control the disease in individual herds. Vaccination by strain 19 had been endorsed by the organization at its yearly meetings since the 1940s and the group pushed for vaccination only plans as part of the federal program. The organization wanted the study to address the low rate of vaccination in modified certified states to determine the best way to encourage participation by reluctant cattle owners.[73] The Texas and Southwestern Cattle Raisers Association wanted the feasibility study to cover all aspects of the program from the federal government to individual cattle owners to see how all of them played a role in the brucellosis program and how they could impact the eradication or control effort.

The discussion of a study to determine the best course of action for the brucellosis program fit into the existing rhetoric pattern that had started in the early 1970s due to the increase in bovine infections as discussed earlier in the chapter. Even with the rise in brucellosis cases at the time, both sides recognized that brucellosis had been eliminated in most cattle at great expense to the federal government, states, and individual cattle owners. Less than 1% of cattle in the federal eradication program tested positive for brucellosis and it only cost the cattle industry a little over $30 million dollars a year in lost revenue, a small amount compared to the estimated $100 million lost a year in 1949.[74] Most dairy cattle owners wanted to continue funding towards elimination to prevent that

[72]Ibid., 22-23.
[73]Ibid., 23.
National Research Council, 5.
[74]National Research Council, vii.

money from being wasted while many beef cattle owners, especially in states on the Gulf Coast where the incidence of the disease increased, wanted to stop funding what they saw as an impossible goal and instead focus on funding control measures. The call for a feasibility study by the Texas Southwestern Cattle Raisers Association was an extension of the rhetoric for changing the monetary focus of the brucellosis program.

It also fit the existing organizational rhetoric calling for control by vaccine for brucellosis rather than eradication through test-and-slaughter. During the development of the federal eradication program through the National Brucellosis Committee and the United States Livestock Association, the organization's committee members pushed for cattle owners to be able to opt into the program and for a separate vaccination only plan along with other concessions for range cattle. As the federal government moved to restrict the movement and sale of non-certified animals in the 1960s, the TSCRA fought to prevent that measure and began to question if brucellosis could be eradicated or only controlled. Just like in the 1960s, the TSCRA realized that it would not be possible to completely eliminate the federal brucellosis program all together. The recognition that some sort of brucellosis program had to be in place to control the disease in order to prevent epidemics in humans and to appease the dairy industry was built into the request for a feasibility study. The organization believed that "a practical control program is possible to render the disease inconsequential to humans and domestic animals."[75] Members of the board of the Texas and Southwestern Cattle Raisers Association thought that a comprehensive program study would show that their longstanding belief in vaccination and control made more sense logistically and financially than the current goal of eradication while still minimizing the risk of brucellosis in people and livestock.

The American National Cattle Association and other cattle organizations representing the beef industry supported the Texas and Southwestern Cattle Raisers' call for a feasibility study of the national

[75]"Cattle Raisers Call For Brucellosis Investigation," 22.

brucellosis eradication program. During a meeting of the brucellosis committee of the United States Animal Health Association in November 1975, the proposal to authorize a feasibility study was approved.[76] Charged with assessing the current system and recommending courses of action, the study committee was to report back to both Congress and the USAHA brucellosis committee at the conclusion of its work.[77] The USAHA hoped the study would resolve the current problems with the brucellosis eradication program and the tension between those who wanted control and those who wanted eradication. The same meeting also addressed how to deal with the national brucellosis eradication program until the study concluded. The committee rejected a proposal by livestock marketplace owners to end the eradication program and rely solely on immunization during the program assessment though it did issue a statement emphasizing the importance of continued use of the strain 19 vaccine.[78] At the same time, it also rejected a congressionally mandated five-year eradication program proposal by the Department of Agriculture deciding instead to hold off endorsing any major plan changes until the newly commissioned study was completed.[79] Though many cattle owners, veterinarians, and animal health officials wanted changes in the federal brucellosis eradication program and national brucellosis policy in the mid-1970s, most wanted to wait for the outcome of the study before formally adopting any new policy or regulations.

The USAHA charged the future committee leading the study with a number of tasks. The major task was to review all aspects of the federal brucellosis eradication program and assess the feasibility of accomplishing eradication. The committee also considered if there was enough knowledge available to complete eradication of brucellosis, what was the cost-benefit to the cattle industry under the present program, if there were any alternatives ways to achieve eradication, how had human health impacted

[76]"Move to Limit Strain 19 Rejected," 1347.
[77]"USAHA Backs TSCRA's Stand on Brucellosis," *The Cattleman* 62, no. 7 (1975): 21.
[78]"Move to Limit Strain 19 Rejected," 1347.
"USAHA Backs TSCRA's Stand on Brucellosis," 68 – 70.
[79]"Move to Limit Strain 19 Rejected," 1347.

the eradication program in the past and present, and if the concept of eradication should be abandoned in favor of a federal control program or no state-federal cooperative program at all.[80] By examining all of the facets of the brucellosis program and comparing the current program to other eradication methods along with the impact of switching to a brucellosis control program or entirely dismantling the national brucellosis program, the USAHA hoped the study would finally settle the issue of control versus eradication and the best method to accomplish this task.

In order to complete the study, the USDA contracted the University of Wisconsin and the University of Texas A&M to run the study starting in July 1976 with the final report to be delivered by August 1978.[81] These land-grant universities had a long history of working with the Department of Agriculture and by using two universities, one in a major dairy state and one in a major beef state, they avoided the perception of bias. The USDA and the USAHA then signed off on the men designated to lead the study. Officially appointed in March 1976, The National Brucellosis Technical Commission (NBTC) consisted of five professionals from different sectors affected by brucellosis and the federal eradication policy.[82] Just like the National Brucellosis Committee tried to have a mix of industries and professions represented so did the study commission. This prevented any one segment of the cattle or medical industry from unduly influencing the study. The two veterinarians on the committee represented veterinary medicine professionals as well as the Midwest states. Human health concerns were also represented by one of the veterinarians who worked with a school of public health and a VA hospital doctor from Maine. The other commission member who worked outside of a land-grant

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[80]"Brucellosis Technical Commission Will Conduct Feasibility Study," *The Cattleman* 62, no. 10 (1976): 21.
Senate Committee on Appropriations, *Brucellosis Eradication and Research: Hearing Before a Subcommittee of the Committee on Appropriations*, 96th Cong., 1st sess., 1979, 39.

[81]Senate Committee on Appropriations, *Brucellosis Eradication and Research*, 39.

[82]The committee members were R. K. Anderson, DVM, MPH, Professor at the Schools of Public Health and Veterinary Medicine at University of Minnesota; David T. Berman, DVM, PhD, Professor of Veterinary Science at University of Wisconsin; W. T. Berry, PhD, Executive Vice President of Western Farm Management Co., Denver; John Hopkins, PhD, Stiles Professor and Head of Agricultural Economics at Texas A&M University; and Robert Wise, PhD, MD, Chief of Staff at the Togus Maine VA Hospital.
Senate Committee on Appropriations, *Brucellosis Eradication and Research*, 156.

university represented livestock owners and the western states. Since cost-benefit analysis lay at the heart of the study, one of the committee members worked as an agricultural economist from Texas A&M who represented the southern states.[83] Some cattle owners in the South worried that no committee member had experience managing cattle in the Gulf Coast states. They also worried that since the USDA funded the study and picked the commission members that the research might be skewed to favor eradication even with representatives from the livestock industry and Texas.[84] As the NBTC began its study, the Texas and Southwestern Cattle Raisers Association approved a resolution at its annual meeting calling for another study funded by Congress and conducted by the National Academy of Science to avoid the perceived bias associated with Department of Agriculture funding the study and approving its commission members.[85] Though the TSCRA had proposed the initial study and awaited its report, they still desired a study that was totally independent from the Department of Agriculture. By trying to force its policy on Texas and then threatening the state with a quarantine, the USDA had destroyed any trust the TSCRA had that they would listen to the concerns of many southern cattle owners over the direction of the federal brucellosis eradication program.

Congressional Hearings On The National Brucellosis Eradication Program And Regional Outbreaks

Negative perceptions of the state-federal brucellosis cooperative extended beyond discontent Texan cattle owners who had long disagreed with federal brucellosis eradication policy. Dairy farmers

[83]"Commission to Study Brucellosis Effort," *Hoard's Dairyman* 121, no. 18 (1976): 1057.
[84]"Brucellosis Technical Commission Will Conduct Feasibility Study," 21.
[85]The National Research Council Subcommittee on Brucellosis, who drew its members from the National Academy of Science, the National Academy of Engineering, and the Institute of Medicine, did conduct an evaluation of brucellosis research that it published in 1977. This study focused on existing research efforts, the funding and methods of research, and what research was needed to cover gaps in knowledge about brucellosis. It did not evaluate the federal brucellosis program as the TSCRA wanted.
"Of Things That Concern Cattle Raisers," *The Cattleman* 62 no. 12 (1976): 145.
National Research Council.

in the Northeast and Midwest, cattle owners in southern and Plains states, and state and federal animal disease control officials all had complaints about the existing brucellosis program. The nature of complaints usually corresponded to the level of brucellosis infection in an area and the type of cattle raised there.[86] In the Gulf states with high levels of infection and more beef than dairy cattle, most cattle owners thought the USDA did not understand the reality of raising cattle in their area and that control was the only feasible outcome for a brucellosis program.[87] Those in brucellosis certified-free states and areas with very low rates of infection along with a number of officials involved in the federal brucellosis program criticized the program as not strict enough on testing and traceback of infected animals allowing for reinfection of certified-free herds.[88] Though they disagreed with the problems of the program and the direction of policy and the brucellosis program, many cattle owners had lost faith in the federal brucellosis program. This posed a problem since the program relied on industry support in order to achieve its goal of eradication as discussed in Chapter Four and Chapter Five. One farm manager claimed that cattle owners in the field had "no confidence in the program, and, in fact, view it as one more boondoggle," and that "the main reason this program will not succeed are that it does not have the support of the cattlemen."[89] If cattle owners disengaged due to anger over perceived problems with the brucellosis program then eradication and even control of the disease became an unlikely outcome.

With the rate of brucellosis infection increasing in the mid-1970s, distrust in the federal program growing, and the potential of national economic harm from actions like the quarantine of cattle, both the House and Senate decided to hold hearings on the brucellosis eradication program and

[86]Senate Committee on Appropriations, *Brucellosis Eradication Program in Florida*, 64.
[87]Just as in previous decades, there was not uniform opinion on brucellosis policy in any one area. In Texas, one of the states where even the animal health officials seemed to oppose brucellosis eradication policy, dairy collectives advocated for eradication during congressional hearings.
National Research Council, 19 – 21.
House Committee on Agriculture, *Brucellosis Eradication Program*, 109 – 112.
[88]National Research Council, 18 – 19.
[89]House Committee on Agriculture, *Brucellosis Eradication Program*, 64.

the increased incidence of the disease. In the past, Congress had been involved in the funding of brucellosis eradication and heard updates on the progress of the eradication program, but these hearings in 1976 and 1977 served as a forum for cattle owners, veterinarians, state animal health officials, and APHIS officials to express their views about the current program and their ideas about the future of brucellosis policy in the United States.[90] The House hearing in 1976 on the brucellosis eradication program covered the state of the program across the nation and drew speakers from almost every state while the Senate hearing in 1976 focused on the Florida outbreak of bovine brucellosis and the House hearing in 1977 centered on outbreaks of the disease in New York and Vermont.[91] These regional hearings actually took place in Florida, New York, and Vermont so that local cattle owners could voice their opinions on the federal plan. This marked a shift from previous brucellosis hearings from the 1950s and 1960s in which testimony mainly came from USDA representatives, veterinarians, and state officials.[92]

At the national focused hearing and at the regional investigational hearings, the difference in opinions between most cattle owners in low prevalence areas and cattle owners in high prevalence areas on how the current brucellosis eradication program had failed were highlighted. The concerns about the brucellosis eradication program fell into three categories, economics concerns, technical concerns, and biological feasibility.[93] Each group and individual testifying before Congress had its

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[90]House Committee on Agriculture, *Brucellosis Eradication Program*.
House Committee on Agriculture, Brucellosis Outbreak in New York and Vermont.
Senate Committee on Appropriations, *Brucellosis Eradication Program in Florida*.

[91]The 1976 House hearing was almost entirely about bovine brucellosis though swine were also part of the brucellosis eradication program. A letter from Iowa Pork Producers Association was read into the record and the potential of contracting the disease from swine in packinghouses was mentioned. As in previous decades, the bovine form of the disease dominated policy discussion since cattle represented a bigger share of livestock and the agricultural economy in the country. Goat owners and producers were not included in the hearings, continuing the trend of goat brucellosis being ignored on a federal level and relegated to a regional issue.
House Committee on Agriculture, *Brucellosis Eradication Program*, 39, 101.
"New York's Cow Disease Spreads," *New York Times*, Jun 12, 1977, 52.

[92]House Committee on Agriculture, *Extend and Expand Milk Programs: Hearings Before the Subcommittee on Dairy Products of the Committee on Agriculture*, 85th Cong. 2nd sess., February 26 and 27, 1958.

[93]Senate Committee on Appropriations, *Brucellosis Eradication and Research*, 38.

own particular issues with the brucellosis eradication program and many of them were ongoing issues that existed since the start of the program, but these general concern groupings pointed to the large problems that the program faced in the 1970s as funding stagnated, epidemiologists had trouble tracing brucellosis infection to the original herd, and cattle owners and animal health officials wondered if the disease could ever be eradicated from all reservoirs.

Almost everyone testifying at the Congressional hearings agreed that the lack of funding for the program in the 1970s hampered the program. This included the lack of funding for research, indemnity, and program operations. Many of those who participated in the program never saw their indemnity payments due to a lack of funding and those who did get paid found the payment too small to cover the cost of a replacement animal.[94] With a depopulated herd and little or no money from indemnity, cattle owners found it hard to redevelop their farms. One Vermont farmer who had to depopulate after an outbreak in the April 1975 reported a loss of at least $170,000 and an inability to get a loan even through the federal farm loan assistance program due to having no equity in the farm.[95] Another likened the impact of depopulation and the lack of adequate indemnity to a natural disaster like a fire and that the financial bind might drive him and his family out of farming.[96] Most of the money in the budget of the federal program in each state went to indemnity, but that total dollar amount had not been permanently adjusted in the 1970s, becoming inadequate to cover the increasing cost of indemnity that came with outbreaks. APHIS wanted more money to cover the cost of indemnity so more cattle owners would participate in test-and-slaughter and depopulate their infected herds. The increased funding would also cover more vaccination costs and the salaries of veterinarians and epidemiologists, all in an effort to achieve eradication as soon as possible.[97]

[94]House Committee on Agriculture, *Brucellosis Outbreak in New York and Vermont,* 4.
[95]Ibid., 50.
[96]Ibid., 12.
[97]Ibid., 44.

The issue of cost-benefit that drove the desire for a brucellosis study and dominated the rhetoric around the brucellosis eradication program in the first half of the decade also appeared as an economic concern during the Congressional hearings. The arguments remained the same with those who wanted eradication stating that it made the most sense to increase funding for the eradication effort so the program could end while those who favored control believed that increasing funding for eradication was throwing good money after bad and that the cost of the disease was less than the cost of eradication. Those opposed to brucellosis eradication favored spending limited APHIS dollars and staff time on eradication of other diseases that seemed to impact the cattle industry more such as anaplasmosis and anthrax.[98]

The Congressional hearings also saw the reemergence of human public health as an economic point for or against eradication. A representative from the American Veterinary Medical Association testified that man and not just animals faced the danger of brucellosis infection unless the eradication program continued.[99] Since most infected individuals worked with animals or in packing plants, human infection meant lost production in the agricultural sector and often required packing plants to payout workman's compensation to cover the wages of those with chronic brucellosis.[100] Opponents of eradication pointed to pasteurization as effectively ending the threat of human brucellosis for milk drinkers and that antibiotics could cure human cases.[101] With a small number of human cases and an effective treatment, the need to eradicate the animal disease reservoir to prevent human cases no longer existed. The economics of brucellosis in both animals and humans contributed to both the case for and against eradication depending on the perspective of the person testifying in the hearing.

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[98]Ibid., 175.
[99]Ibid., 81.
[100]Ibid., 12.
House Committee on Agriculture, Brucellosis Eradication Program, 110.
State Department of Agriculture, Minutes of the California Dairy Animal Health Committee Meeting March 16, (1971) MD 83/45c Carton 7, Folder Brucellosis, The Bancroft Library.
[101]"Brucellosis Changes Rejected," 106.
House Committee on Agriculture, *Brucellosis Eradication Program*, 175.

The second group of complaints, the technical issues, had to do with the management and day-to-day operations of the brucellosis eradication program. One of the major points of contention for both dairy and beef producers was the difficulty of quarantining reactor and exposed cattle. Both dairy and beef herds grew in size in the 1960s and 1970s and the rise of feedlots meant large amounts of cattle often spent more time together in small spaces. It was difficult for farm managers and feedlot owners to segregate out diseased and exposed cattle and keep them quarantined until they had two negative tests at least two months apart. This meant reactor and "S" branded cattle almost always went to slaughter for indemnity rather than back to the farm for quarantine, leading to a loss in profit for a cattle owner.

Most producers also lamented the lack of veterinary staff to vaccinate cattle and manage herds in the program as dictated under the Uniform Method and Rules.[102] By requiring that vaccination had to be administered by a veterinarian, the program needed far more animal medicine doctors than available in many areas, especially rural, sparsely populated areas.[103] Too few veterinarians was not the only factor contributing to the low rate of vaccinations. The lack of reimbursement for inoculation made the economics of vaccinating with strain 19 unfavorable. As discussed in the Chapter Four, cattle owners did not medically treat cattle unless it was cheaper than letting the disease run its course. For many cattle owners, the cost of inoculating each of their animal outweighed the chance of them contracting brucellosis or the economic impact of infection, especially since the vaccine did not fully immunize an animal against the disease. The USDA policy to deemphize the use of strain 19 vaccine in certified-free areas also upset cattle owners who saw it as the first line of defense against brucellosis.[104] Dairy cattle owners, beef cattle owners, and the USAHA all advocated for the expanded use of the vaccine in all areas to provide at least a baseline of immunity for herds. The lack of vaccinated cattle

[102]House Committee on Agriculture, *Brucellosis Outbreak in New York and Vermont,* 44.
[103]House Committee on Agriculture, *Brucellosis Eradication Program,* 78 – 80.
"Cattle Raisers Call For Brucellosis Investigation," 23.
[104]House Committee on Agriculture, *Brucellosis Eradication Program,* 106, 117.

made it difficult for those with depopulated herds to find vaccinated replacement cattle, and the cause of outbreaks in certified-free herds was often brucellosis infected replacement cattle.[105] Vaccinating all cattle could prevent some of these outbreaks or lessen the effect of reinfection, preventing the need to fully depopulate all the cows from a herd.

The regulations about vaccination in certified-free areas was not the only part of the Uniform Method and Rules that confused cattle owners. Many from both the dairy and beef cattle industry thought the USDA needed to provide cattle owners with more education and outreach about brucellosis and the federal program.[106] When the program began, there had been a push to educate cattle farmers as discussed in the previous chapter. However, as the program drew closer to its targeted end date and APHIS moved on to focus on other diseases, education and outreach had decreased. Cattle owners who did not know about the consequences of brucellosis in their herds or who puzzled over regulations made for poor partners in the eradication effort.

The UMR for state brucellosis eradication programs also faced criticism by those in high prevalence areas for both not being flexible enough to accommodate difference in regions and cattle management techniques. Many cattle owners from Gulf Coast states emphasized that the different climate and geography of their states and the practice of having large herds of both beef and dairy cattle required a different strategy to deal with brucellosis than in other areas.[107] They felt that their point of view and concerns about the brucellosis program went ignored since even though "there had been area, regional, and statewide meetings where producers have been allowed to attend and present their thoughts . . . all these meetings end with the ranking USDA official reading the time proven

[105]House Committee on Agriculture, *Brucellosis Outbreak in New York and Vermont*, 12, 28.
[106]House Committee on Agriculture, *Brucellosis Eradication Program*, 58, 78 – 80.
[107]These claims recalled the initial investigations of abortion storms in New York when doctor tried to determine if any geography or climate of a farm may be causing brucellosis as discussed in Chapter 2. Unlike those studies, these cattle owners did not assert that the environment caused contagious abortions, just that it played a role in how brucellosis spread and how to manage the disease.
Ibid., 79.

ineffective Methods of Uniform Rules for Brucellosis."[108] Dissenting cattle owners and veterinarians felt a lack of trust and understanding from the USDA that developed into an antagonistic relationship instead of a cooperative one. They wanted a much more local focus and control over brucellosis eradication or control efforts.[109] These cattle owners wanted the power to modify the brucellosis program to lie with the states and area officials and cattle owners rather than at the federal level.

Criticism of the UMR also came from eradication supporters who viewed the guidelines as too flexible and instead favored a strong federal policy with little room for interpretation or change in each state. Irma May Rouse, a Nebraska animal health official working for APHIS, wrote to Representative Charles Thone of Nebraska to complain that state and federal officials either misinterpreted or ignored the regulations in the UMR leading to a misuse of indemnity funds, the free movement of diseased cattle, and the certification of areas with incidence of disease. She blamed all levels of government and cattle owners since "compromise at any level is quickly publicized among state officials and livestock industry representatives with everyone trying to take advantage of the weakened position."[110] Other state veterinarians in low prevalence areas placed all the blame at the feet of cattle owners in high prevalence areas for taking advantage of the recommendation nature of the UMR by not vaccinating cattle or testing. They also wanted stricter federal regulations to force all cattle owners into participating in the program.[111] The desire for a strict federal policy set down to the states and cattle owners directly contradicted with the demands from the high prevalence to allow for more local control over the program. Who determined the rules and regulations of the brucellosis program stood as a major area of contention.

Market cattle testing and traceback of infected animal dictated by the Uniform Method and

[108]Ibid., 80.
[109]Senate Committee on Appropriations, *Brucellosis Eradication Program in Florida*, 71.
[110]Ibid., 84.
[111]House Committee on Agriculture, *Brucellosis Eradication Program*, 197.

Rules drew criticism from beef cattle owners. They worried that the process took too long making it harder to determine what happened to all the cattle in the herd and resulting in some of them being sold as replacement cattle before knowing that they had been exposed to brucellosis. Both the agglutination testing and the epidemiological work of following the reacting animal to its original herd took too much time. This created problems for cattle owners waiting to find out if their herds would be placed under quarantine. The solution to faster testing, the card test, which allowed for on-the-spot testing at ranches, also came under fire from southern cattle owners and veterinarians who thought it led to overkill due to a lack of sensitivity.[112] A representative for Kentucky producers suggested the idea of a national identification program for cattle to speed the traceback process, but the idea never progressed due to the existing opposition discussed in the previous chapter.[113] Most cattle owners and veterinarians frustrated with the MCT process and card testing called for a better method of testing that was quicker and resulted in fewer false positives.

The third area of concern, biological feasibility, stemmed back to the original issues some cattle owners had with the program and the debate about whether it was rooted in scientific theory or not. This included issues with the accuracy of the agglutination test and the amount of overkill due to false positives and the incomplete immunity provided by the strain 19 vaccine. The threat of reinfection from wildlife and other domestic animals had expanded since more types of brucellosis had been discovered and more animals had been found to carry the disease. Cattle owners worried about wild reservoirs of *B. abortus* such as elk, bison, and deer along with harboring concerns about infection by other species of *Brucella* from horse, swine, sheep, and dogs.[114] Reports of predators like foxes and birds of prey exposing cattle to brucellosis by carrying aborted cattle fetuses from diseased farms to certified-free

[112]Senate Committee on Appropriations, *Brucellosis Eradication Program in Florida*, 71.
[113]House Committee on Agriculture, *Brucellosis Eradication Program*, 124.
[114]Ibid., 238.

ones were also reported in the hearings.[115] Those who favored control claimed wild reservoirs could never be managed and that made eradication impossible under the current eradication system. Even if every domestic cattle herd became certified-free from brucellosis, cattle faced the threat of reinfection by these wild reservoirs and other farm animals that may have other species of the disease causing bacteria. Unless all brucellosis could be eliminated, eradication would never be achieved.

Brucellosis Research in the 1970s

While different groups of cattle owners, veterinarians, state animal health officials, and Department of Agriculture officials disagreed about the problems of the brucellosis eradication program and how to remedy them, there was one issue they all agreed on, that more research into brucellosis was needed. With the eradication of brucellosis in the United States expected in 1975, the federal brucellosis program reduced its funding for brucellosis research starting in 1971.[116] The internal funding for the bovine brucellosis research program shrank to just over $57,000 in fiscal year 1972.[117] With the assumption that the strain 19 vaccine and agglutination testing could achieve eradication, the Department of Agriculture saw no need to develop a new vaccine or method of testing. The lack of funding for research may also have resulted from moving the state-federal cooperative from the Agricultural Research Service arm of the USDA to the newly formed Animal and Plant Health Inspection Service. Though the eradication program moved, research efforts continued to be housed within ARS. Scientists working on brucellosis no longer worked with those who ran the eradication program and for the first time, the federal eradication effort was decoupled from federal brucellosis research efforts. APHIS officials could recommend that ARS researchers conduct a study, but they no longer made the decision on the type of research conducted. The little amount of funding available

[115]House Committee on Agriculture, *Brucellosis Outbreak in New York and Vermont*, 61.
[116]House Committee on Agriculture, *Brucellosis Eradication Program*, 4-5.
[117]National Research Council, 164.

went to interagency and external grants instead of to USDA researchers.[118] Those creating and enforcing brucellosis policy had minimum connection and discussion with those conducting research, unlike when the brucellosis eradication effort had been housed in the Bureau of Animal Industry.

This decrease in funding coincided with other events that reduced the amount of bovine brucellosis research conducted in the United States. The National Institutes of Health essentially ended its funding for brucellosis research around the same time as ARS and APHIS did.[119] Brucellosis did not seem to be a priority for any federal health related research agencies in the early 1970s. With a lack of available federal funds for research on the disease, few American researchers began or continued work on brucellosis related research. The National Research Council report on the state of disease research determined that "so few scientists remain active in brucellosis that there is limited opportunity for the intellectual synergism necessary for creative original research."[120] This contrasted with the mid-twentieth century when the Department of Agriculture and the United States Public Health Service supported brucellosis research and created conferences and meetings for scientists to share their work with each other and the public. No domestic large scale conference on brucellosis had been held since the beginning of the official state-federal eradication program, though research advancements had been presented at National Brucellosis Committee and United States Sanitary Livestock Association meetings through the 1960s. However, few laboratory researchers attended these meetings so they did not serve the same function as the conferences in previous decades. The proposed eradication date for brucellosis effectively stopped research into brucellosis.

The lack of research into new types of testing and vaccination frustrated cattle owners in particular. The agglutination test had been established as the best test of the disease in the 1920s and though the technology had been developed into different types of tests like card test and brucellosis

[118]Ibid., 159.
[119]Ibid., 25.
[120]Ibid., 25.

ring test, little had changed about the technology since then. It still resulted in false positives and negatives, requiring multiple tests to determine if an animal had brucellosis.[121] Many cattle owners and veterinarians wanted a better test that determined the brucellosis status of an animal quickly and exactly. The same complaint of old technology existed for the strain 19 vaccine that had been developed by the BAI in the 1930s. While the vaccine dose had been reduced, it still resulted in false positives on the agglutination test and provided incomplete immunity. Cattle owners wondered why they had to deal with an "outdated" test and vaccine in an era when medical knowledge and testing seemed to increase exponentially.[122] Cattle owners wondered why if science could develop new drugs for human brucellosis like antibiotics and new vaccines for polio, mumps, measles, and other human diseases, then why had no one created a better brucellosis test or vaccine in the last 30 years.

The increasing number of human and bovine brucellosis cases in 1973 and the resulting debate over the eradication program changed priorities over brucellosis research. Federal and state agencies, industry, and universities all extended or grew their funding and research once the state-federal cooperative announced it would not reach its goal of eradication by 1975. The Agricultural Research Service increased its bovine brucellosis research funding threefold from 1973 to 1976 and added money to the program from its contingency research fund.[123] The network of agriculture agencies developed in the mid and late nineteenth century along with the USDA also expanded their research work with the Florida animal health agency developing a plan for adult vaccination in high prevalence herds and increased research occurring at state agricultural experiment stations and land-grant universities such as University of California and Texas A&M University to explore better methods of

[121]Donald Pietz, "Brucellosis Antigens and Serologic Test Results," in *Bovine brucellosis: An International Symposium*, ed. Richard Crawford and Richard J. Hidalgo (College Station, TX: Texas A&M University Press, 1977), 49-60.
[122]House Committee on Agriculture, *Brucellosis Eradication Program*, 79.
[123]National Research Council, 164.

testing, inoculation, and eradication.[124] Industry also funded studies through professional organizations. Dairy Research Inc., a research organization funded by dairy producers, awarded $77,750 in 1976 for research into a better vaccine.[125] Discontent with the brucellosis eradication program and the desire for a better vaccine and test that could lead to eradication drove the new boom in bovine brucellosis research. Industry, government research agencies, and land-grant universities worked together just as they had during the late nineteenth and early twentieth centuries to learn more about brucellosis in order to control and eradicate it.

In July 1976, Texas A&M held an international symposium on bovine brucellosis in order to discuss improved methods of detection and prevention of brucellosis along with newly suggested economic and efficient methods of brucellosis eradication.[126] This symposium provided a forum for bovine brucellosis researchers to share ideas and research, creating a space for the intellectual creativity that the National Research Council claimed the brucellosis research community lacked earlier in the decade. American and international researchers, cattle owners, members of state animal health agencies, and APHIS officials including the director of the federal brucellosis eradication program, Dr. Paul Becton, attended the meeting and a number of other meetings including a southern regional conference of state agricultural experiment stations, the Texas Bovine Brucellosis Study Committee, and the Subcommittee on Brucellosis Research from the National Research Council meetings held at Texas A&M at the same time.[127] The symposium became a confluence of researchers, animal disease control policy makers, and members of the cattle industry serving as a place for them to talk about the latest research in bovine brucellosis and how it might impact the eradication effort.

The topics discussed at the conference were similar to those presented at the brucellosis

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[124]Crawford and Hidalgo, ix.
"New Brucellosis Vaccine Is Now Being Tested," *Hoard's Dairyman* 122, no. 4 (1977): 244.
"Animal Health Roundup," *The Cattleman* 63, no. 6 (1976): 29.
[125]"UDIA Provides Research Funds for Tough Problem," *Hoard's Dairyman* 121, no. 6 (1976): 373.
[126]Crawford and Hidalgo.
[127]"Brucellosis Symposium Attracts International Health Authorities," *The Cattleman* 63, no. 3 (1976): 112.

conferences in the mid-twentieth century. Most of the presentations focused on the epidemiology of the disease, cattle management practices, and the advantages of different tests and vaccines. Researchers discussed several new species of brucellosis along with the impact of wildlife reservoirs.[128] The conference also included talks on the new research into adult vaccinations in Florida, the use of 45/20 vaccine, the French, Irish, and Australian eradication programs, and the development of a new promising vaccine in France.[129] While researchers worked with different types of brucellosis to learn about their epidemiology and the relationship with their hosts and identified new strains of *Brucella* as possible vaccines, little research had been done into the cellular biology of the bacteria. There was a reason the same general research topics remained so similar to those presented earlier in the century. Researchers recognized that little progress had occurred in understanding bovine brucellosis. The disease remained hard to diagnosis and the bacteria difficult to isolate and grow.[130] Until researchers could reliably isolate and culture the bacteria, it remained unlikely they would move beyond researching the epidemiology of the disease, the differentiation of strains including their use as vaccines, and tests that determined exposure to *Brucella*. However, despite any research progress made in the mid-1970s, Dr. Frank Mulhern, the APHIS director, cautioned that new technology alone could not solve the brucellosis problem. He "noted the need for better communication with producers about how brucellosis is spread and the steps involved in eradication. 'Merely improving technology is not enough.'"[131] Department of Agriculture officials knew that without cattle owners knowing the risk and remedies of brucellosis they would not support the eradication effort and the federal eradication

[128]Crawford and Hidalgo, 139, 156-157.
[129]"Brucellosis Symposium Attracts International Health Authorities," 32-33.
[130]Researchers had determined that *Brucella* was an intracellular bacterium in the mid-twentieth century. This biological feature of the organism made it difficult to detect and treat and led to it being a chronic infection in some infected animals and humans. While researchers had identified the bacteria as intracellular, they knew little about the relationship of *Brucella* to the host cells and the pathogenicity of the organism.
Crawford and Hidalgo, 12-14.
James M. Shaffer, Carrell J. Kucera, and Wesley W. Spink, "The Protection of Intracellular Brucella Against Therapeutic Agents and the Bactericidal Action of Serum," *The Journal of Experimental Medicine.* 97, no. 1 (1953): 77-90.
[131]"Research, Flexibility Needed in Brucellosis Eradication," *The Cattleman* 64, no. 3 (1977): 25.

program would not succeed.

Control Or Eradication

No major changes in the federal brucellosis eradication program or policy occurred during the mid-1970s as every organization and government agency waited for the results of the National Brucellosis Technical Commission study. However, the results of new research and occurrence of outbreaks led to some small changes and compromises in federal and state brucellosis programs during these years. This included the development of more comprehensive vaccination programs in Texas and Florida in an attempt to reduce the rate of infection in high prevalence areas.[132] At the same time, states with brucellosis reinfection like Washington and high rates of infection states like Texas tightened testing and quarantine for cattle arriving from out-of-state in order to prevent an increase in infection.[133] While states tried to create policies to prevent brucellosis infection, the United States Department of Agriculture compromised with cattle owners by dropping testing requirements for modified certified cattle moving from one state to another without a change of ownership.[134] This addressed the concerns of a number of ranchers who operated in more than one state, but many beef cattle owners still distrusted the state-federal brucellosis eradication program.[135] Animal disease control officials also increased indemnity payouts and began to pay for slaughtered female calves exposed to infected dams, addressing the concerns of dairy and beef cattle owners who avoided slaughtering their cattle for financial reasons.[136] Even with these policy changes, cattle owners still thought more

[132]"Animal Health Commission Presented Guidelines for New Brucellosis Program," *The Cattleman* 63, no. 5 (1976): 21.
"OK Limited Adult Use of Strain 19 Vaccine," *Hoard's Dairyman* 122, no. 6 (1977): 433.
"Florida Adopts Strict Brucellosis Measures," *Hoard's Dairyman* 122, no. 17 (1977): 1077.
[133]"Animal Health Commission Adopts Brucellosis Changes," *The Cattleman* 63, no. 9 (1977): 32.
"Washington Cattle Trade Faces Bang's Crackdown," *Hoard's Dairyman* 122, no. 14 (1977): 781.
[134]"USDA Eases Testing," *Hoard's Dairyman* 122, no. 10 (1977): 678.
[135]"C. Gus Glasscock, "Letter to the Editor," *The Cattleman* 63, no. 10 (1977): 194.
"TSCRA Tells Brucellosis Commission Flexibility Is Needed for Eradication," *The Cattleman* 64, no. 1 (1977): 21.
[136]"Raise Bang's Indemnity," *Hoard's Dairyman* 123, no. 12 (1978): 772.

cooperation and understanding was needed between industry and officials in the eradication program in order for it to be successful.

Both cattle owners and animal health officials saw cooperation and an improved relationship between industry and state and federal program officials as a method to achieve their goal of how to deal with brucellosis in the United States. However, some cattle owners, mainly beef producers in Gulf Coast states, veterinarians, and state health officials wanted control while other cattle owners, mainly in low or no prevalence areas, veterinarians, state health officials, and APHIS officials wanted eradication of brucellosis. The issue of control or eradication was the question that lay at the heart of all the debate over the brucellosis eradication program in the 1970s. The challenges to the Uniform Methods and Rules, the court cases, the congressional hearings, and the National Brucellosis Technical Commission study all focused on this issue. There had always been dissent and opposition to the state-federal brucellosis eradication cooperative that grew or shrank with the success of the program. The latest round of opposition came as the program missed the eradication deadline and the incidence of the disease increased for the first time in the 1970s. The reemergence of brucellosis cost the federal program the industry support it once had and without industry support the brucellosis eradication program could not hope to be successful. The brucellosis eradication effort had been the longest running federal eradication program in the United States. The Department of Agriculture had allotted $584,006,521 to brucellosis eradication from 1934 through financial year 1975, making it the most expensive eradication program too.[137] Before spending more time and money, most people involved with the program wanted to know if increasing the funding would actually achieve eradication or if the disease could only be controlled. The program stood at a crossroads in the mid-1970s while waiting to hear the results of the NBTC. Congress, cattle owners, and the United States Animal Health Association all continued lobbying for their point of view on brucellosis, but rejected any major

[137]National Brucellosis Technical Commission, Report: *Appendix D,* D-5.

changes to current brucellosis eradication policy or funding until the study findings were reported and the answer to control or eradication was determined. All thought the scientific study would lay out the best way to handle brucellosis in the United States and answer the question of eradication or control.

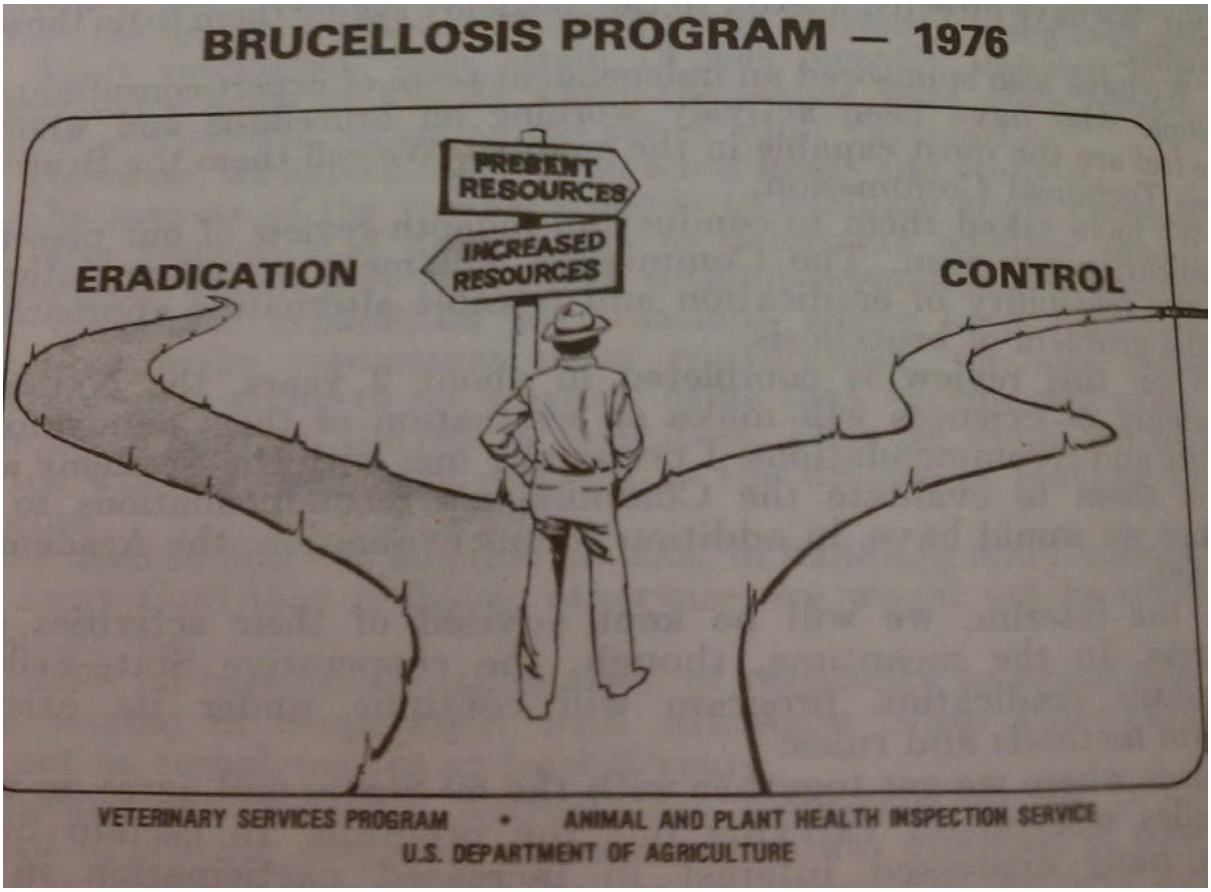

Image 6.2: Submitted during APHIS testimony to the Congressional Hearing on the Brucellosis Eradication Program, 1976.[138]

Conclusion

By the 1970s, government policy transformed brucellosis into an epizootic disease in most parts of the United States. In nineteenth century and the first half of the twentieth century, the disease was an enzootic infection that cycled through farms. Producers, particularly dairy farmers, may have been inconvenienced by the resulting abortions and decreased milk production, but most of them did not see abortion storms as a disaster that destroyed a farm or the value of cattle. During the mid-twentieth

[138]House Committee on Agriculture, *Brucellosis Eradication Program*, 8.

century, the state-federal brucellosis eradication program successfully reduced the prevalence of the disease in most states. As a result, program officials deemphasized the use of the strain 19 vaccine in certified-free areas to cut operational costs and reduce the possibility of inaccurate testing. The reduction in the vaccination rate coupled with the near eradication of brucellosis infection led to herds with little or no immunity to the disease since cattle had not been exposed to *B. abortus*, not even the vaccine strain. When the bacteria was reintroduced to these populations through replacement animals or contact with wild animals, every animal in the herd was susceptible to the disease and every breeding female in the herd could potentially abort her next calf, devastating the calf crop and dairy production of the reinfected herd. In addition, in order to regain certified-free status needed to sell dairy products and cattle in most areas, cattle owners with reinfected herds had to depopulate their livestock by slaughtering all or nearly all their animals. Epizootic brucellosis in the 1970s led to greater economic damages than enzootic brucellosis in the late nineteenth and early twentieth centuries. This change in the severity of the outcome due to brucellosis infection and the potential for an epizootic outbreak of the disease pushed federal animal health officials to continue the state-federal program and fully eradicate brucellosis rather than allow it to remain enzootic in certain herds and areas as desired by some beef producers.

The desire to prevent reinfection of certified-free herds, which made up 99% of the United States cattle population, led to increased interest in fully eradicating brucellosis in the United States in the early 1970s and changes to the eradication program's rules. This included more testing requirements, no titer flexibility for vaccinated animals, and less tolerance of animals suspected of being exposed. The shift in the beef industry towards feedlots meant that beef cattle spent more time closer together in larger herds than they did on the range. The changes to the UMR reflected this industry transition and targeted exposure through market channels by labeling all cattle that interacted with a reactor animal as diseased rather than just those from the reactor animal's herd of origin. This

modification of the Uniform Method and Rules changed how the disease status of an animal was derived. The health of one animal could be transferred to all cattle it came in contact with due to the policy of branding exposed cattle. In the 1950s and 1960s, the personal test status of an animal labeled it as non-reactor (non-diseased), suspicious (isolated as if diseased), and reactor (diseased) as discussed in the previous chapter. Some animal health officials tried to transition brucellosis status from the individual level to the area level in the 1960s, but that policy initiative failed to gain support among cattle owners. In the early 1970s, program officials dropped the suspicious category and all reactors became diseased in the eyes of the eradication program as did cattle exposed to reactor animals. The brucellosis status of an individual animal no longer served as the marker of its health, but rather the health of one animal determined the health of the herd or any cattle it came in contact with for more than twenty-four hours in the market chain. In the previous two decades, herd health derived from the health of each animal in it and a diseased animal could prevent a herd from being certified, but the removal of the reactor animal and further testing made the herd brucellosis-free. Under the changed eradication program regulations, the removal of the diseased animal did not purify the herd. Every animal in the group gained the label of infected regardless of test status. Even a negative test for an individual animal could not change its status or lift the quarantine on it. Exposure to one reactor animal became enough to condemn an animal regardless of the results of its serological tests for brucellosis.

With the new policy in place, the Department of Agriculture hoped to eradicate bovine brucellosis by 1975, but that goal faded as the incidence of brucellosis in both cattle and humans increased in the mid-1970s. This reemergence of brucellosis led to complaints about the state-federal eradication program and reignited divisions and arguments that had existed since the initial attempts to federally fund brucellosis eradication in the 1930s. However, while in the mid-twentieth century the divide between supporters of the federal eradication effort and dissenters usually occurred based on which part of the cattle industry a person participated in. Dairy cattle owners, veterinarians working

with dairy breeds, and states with large dairy economies usually favored a state-federal cooperative eradication program with test-and-slaughter while range cattle owners, their veterinarians, and states with a significant beef industry tended to want voluntary control of brucellosis through vaccination of calves and even adult cattle. By the 1970s, the Accelerated Brucellosis Eradication Program had successfully eradicated brucellosis in most states including range states in the west and brucellosis infection became a regional problem for cattle owners in the South, a region dominated by the beef industry. Increasingly, the separation between those who desired brucellosis eradication and those who wanted a control program depended on a combination of industry, geography, and the prevalence of brucellosis. Most dairy cattle owners and some beef herd owners in certified-free states viewed the increased incidence of brucellosis as a reason to develop stricter transportation and testing rules while many beef cattle owners, particularly those in southern states, saw the reemergence of the disease as a sign that it could never be eradicated, only controlled.

In 1975, the Department of Agriculture renewed its commitment to eradicate brucellosis by modifying the Federal Register and the Uniformed Method and Rules to close any loopholes that allowed brucellosis infected animals to avoid testing and move from state to state. These new regulations reduced the flexibility of state programs and limited the cooperative nature of the brucellosis eradication effort. Through the changes to the federal code and the UMR, the federal government exerted more authority by dictating stricter parameters for state brucellosis eradication programs. While most states adopted these new regulations into their state plans, Texas rejected the mandatory modified regulations to the state-federal program due to the influence of the state's beef producers. As a result, the USDA announced a quarantine on Texas cattle leading to a series of lawsuits that forced the state to comply with the new brucellosis program rules. As discussed in the first chapter, the threat of quarantine had historically been used by animal health officials not only to isolate diseased animals but also an economic incentive to encourage participation in animal disease control efforts. By

proposing to quarantine the country's largest cattle producing state, the USDA further shifted the balance of the brucellosis eradication program towards the federal government. While the program still operated as an industry-state-federal cooperative, the federal government exerted more pressure on states and industry to comply with its policy in the mid-1970s by making changes to the program rules and threatening to quarantine any state that did not adopt the new regulations.

The changes to the state-federal brucellosis program made by the Department of Agriculture in the mid-1970s aimed to eliminate brucellosis in areas with persistent infection and prevent reinfection among disease-free cattle. However, this policy did not address many of the complaints raised by member of the cattle industry, veterinarians, and state animal health officials who lost faith in the eradication program as the prevalence of the disease increased in the 1970s. While the federal government had exerted more control over the program and its management, it was still a cooperative and needed the support of cattle owners, private veterinarians, and state animal disease control officers to operate at a local and regional level. Reports from Congressional hearings in 1976 and 1977 revealed the views of these groups along with those of federal program officials and the undercurrent of discontent that many felt towards the program. Most criticisms about the program related to economic concerns, technical concerns, or biological feasibility. Both those who supported eradication of brucellosis and those who favored control had complaints about the funding of the program, its management, and the lack of research on brucellosis since the start of the program. Few stake-holders in the brucellosis eradication program thought that the cooperative could stay the course. Most wanted change in order to either eradicate the disease or control it.

While many showed discontent with the brucellosis eradication program, most hoped to improve and modify it using scientific agriculture. During the mid-1970s, the Department of Agriculture, state agencies, and the cattle industry increased funding for brucellosis research using the same agricultural research network developed during the late nineteenth and early twentieth centuries.

This effort rebuilt the bovine brucellosis research community in the United States, resulting in new research on the epidemiology of the disease, the biology of *Brucella*, and the development of new vaccines. Just as they did in the 1920s and 1930s, symposiums and conferences on the disease gave researchers a forum to share ideas, discuss their work, and develop new technologies that could improve the brucellosis eradication or control effort.

Those involved in the brucellosis eradication program not only looked to science to improve understanding of the disease and create an improved vaccine, but also to determine the best course of action concerning the disease in the United States. At the request of several beef industry organizations, the United States Animal Health Association established a group of investigators to conduct a study on the state-federal eradication effort. Starting in 1976 and expected to finish in 1978, the National Brucellosis Technical Commission was charged with investigating the feasibility and cost-benefit of the eradication program and any alternatives to the program including a control program or abandoning any state-federal brucellosis effort. The USAHA, many cattle owners, veterinarians, and animal health officials thought that the NBTC study would settle the debate over the brucellosis eradication program and the best method to deal with brucellosis nationally. They believed that the study would provide them with unbiased data that would solve the problems of the current brucellosis eradication effort leading to a scientifically developed brucellosis policy. The acceptance of scientific agriculture and the authority of science among program participants delayed reorganization of the eradication program despite discontent with it during the mid-1970s. These groups waited until the publication of the study results in the late 1970s to move forward with changes to the state-federal brucellosis cooperative, effectively placing the eradication effort on hold for two years.

Chapter 7: Cutting the Tail Off the Dragon – The Eradication of Brucellosis in the United States, 1978 – 2000

The discontent over the state-federal brucellosis eradication program in the 1970s and the question of whether brucellosis could be eradicated or only controlled led to the creation of the National Brucellosis Technical Commission (NBTC). Charged with determining the feasibility of brucellosis eradication and the most effective way of implementing an eradication or control plan, the National Brucellosis Technical Commission used statistical and economic analysis, surveys of industry and state animal health agencies, testimony of cattle owners, veterinarians, and government employees, and computer modeling to determine the most effective and efficient program that accounted for the economic interests of cattle owners, public safety, and health. Published in late 1978, the committee's report supported eradication rather than control leading to a renewed effort to eliminate the disease in the 1980s.

While some cattle owners still disliked the idea of brucellosis eradication, most went along with the proposed changes due to the scientific assessment of the NBTC and the threat of quarantine. Almost as soon as the Department of Agriculture adopted the recommendations of the technical commission and developed a new state-federal brucellosis eradication program, the Reagan administration attempted to end it by proposing to defund the program in 1982. The USDA, state animal health officials, and cattle owners worked together to lobby for federal money and establish funding priorities for the program. In 1984, once all states adopted the new Uniform Method and Rules, the federal government enacted the UMR as part of the Code of Federal Regulations, and the budget had been decided, the brucellosis eradication program began classifying states and continuing the work of the earlier state-federal program. Through the rest of the 1980s and the late 1990s, the program faced no major changes, just slight modifications based on brucellosis research and the realities of uncovering the remaining cases of the disease. In 1997, in order to target the less than one hundred infected herds,

the Department of Agriculture implemented the Brucellosis Emergency Action Plan, speeding the response to positive testing. The United States hit a milestone of no infected herds on December 31, 2000 though veterinarians expected more cases to emerge due to the long incubation period of the brucellosis and the presence of a wildlife reservoir of the bacteria, so the eradication program continued into the twenty-first century.

The National Brucellosis Technical Commission Report

In the two years it conducted its review of the state-federal brucellosis eradication program, the National Brucellosis Technical Commission utilized many different methods to try and gain a better understanding of how the program operated, the existing problems, and the cost benefit of eradication versus control. They not only held hearings and distributed surveys so that health professionals working with both humans and animals, researchers, and cattle owners could voice their opinions and evaluate current practices and research being conducted on brucellosis, but also assessed cattle owners' knowledge about brucellosis, determined the cost of human brucellosis infection, studied in-depth the procedures and results of the state-federal brucellosis program in twelve states, and used computer modeling designed by agricultural economists to estimate the impact of eradication, control, or no program on the cattle industry.[1] As a result of this thorough investigation, the commission not only determined if eradication or control best served the nation's agricultural and public health interest, but also identified the problems with the existing program, possible areas of improvement, and how to gain industry support for the program.

In August 1978, the NBTC published its findings and recommendations for the state-federal eradication program. In the report, they examined how the structure of the dairy and beef industry

1 National Brucellosis Technical Commission, *Report: National Brucellosis Technical Commission* (Washington, D.C.: Animal and Plant Health Inspection Service, United States Department of Agriculture, 1978) , ii.

impacted the program, what biological, public health, informational, political, legal, sociological, cultural, and economic factors influenced policy and conducted cost benefit analysis. By looking at the industry itself, the commission determined why brucellosis eradication mattered and how practices of cattle owners impacted the program. As the dominant agricultural product in the United States, the sale of cattle totaled $18 billion in 1975, or 20% of all livestock products and crops. Brucellosis had the power to limit these sales through decreased calf stock and restricted movement of reactor cattle.[2] Dairy cattle also faced economic losses from brucellosis due to loss of milk production and loss of Grade A status. Grade A milk accounted for 82% of all milk sales and a herd had to be certified-free to qualify for this status. By having reactors, dairy herds lost out on a large percentage of the milk market.[3] Grade A status provided an economic incentive for dairy cattle owners to eradicate brucellosis.

Changes in both the beef and dairy industries in the 1960s and 1970s led to increased incidence and risk of infection. In the southern states, a new group of cattle owners who owned a few head of cattle for economic or social benefit developed. These owners usually had less knowledge about herd management and they frequently sold and traded cattle not just for economic but also social reasons at meetings, avoiding the market testing system. Movement of these cattle served as a way to transport brucellosis and contributed to the increased incidence of the disease in the southern beef cattle population.[4] The dairy industry also underwent changes during the same time period that contributed to the spread of brucellosis. Due to better technology and the economics of the industry, the number of dairy farms had declined in the 1970s leading to larger herds on the remaining farms.[5] Tending to these large herds required many cattle owners to hire employees who had no financial ownership in the cows and therefore no incentive to prevent the spread of disease. Often these employees had less knowledge

2 Ibid., 4.2-1.
3 Ibid., 4.3-1 – 4.3-3.
4 Ibid., 4.8-4 – 4.8-5.
5 Ibid., 4.3-1.

about animal disease just like the newer beef cattle owners of the South. As a result, many paid less attention to the health of the milking herd.[6] The increased movement of beef cattle, large dairy herds, and people with less knowledge about brucellosis all contributed to the increased prevalence of the disease in cattle during the 1970s.

The technical commission also found that changes in the cattle industry impacted the procedure of brucellosis eradication. When the first coordinated eradication effort began in the 1930s, dairy cattle outnumbered beef cattle 2 to 1. Dairy cattle owners saw brucellosis as a threat while range cattle owners did not, and public pressure centered on removing the bacteria from dairy products.[7] The initial eradication effort focused on eliminating the disease in dairy cattle for these reasons. By the 1970s, the ratio had flipped so that beef cattle outnumbered dairy cattle almost 2 to 1, but the legal requirements of having brucellosis-free milk placed a great economic burden on dairy cattle owners to keep the disease out of their herds.[8] The movement of beef cattle increased the incidence of brucellosis and led to a greater potential of reinfection in already disease-free dairy herds. Since the two populations of cattle interacted with each other, any plan had to target both populations or the threat of reinfection would remain.[9] While beef and dairy cattle owners often separated themselves based on their type of farms or ranches, the cattle industry had to work as a whole to eliminate the disease.

The growing number of bovine brucellosis cases contributed to an increasing number of human cases in the 1970s. The NBTC reaffirmed the concept that human brucellosis existed predominantly as an occupational illness and that the only way to eradicate the disease in man was to eradicate it from animals.[10] Along with occupational health concerns, a growing consumer demand for raw milk created

6 Ibid., 4.8-5.
7 Ibid., 4.3-1.
8 Ibid., 4.3-1.
9 Ibid., 4.3-6.
10 Ibid., 4.5-1.

a potential new pool of people susceptible to brucellosis caused by *B. abortus*.[11] The commission placed a high value on human health when deciding if doing something or nothing resulted in better health and economic outcomes and saw "the issue of human health [as] a count against the philosophy of doing nothing and is a force leading to a program of control with eventual eradication of the disease from animals."[12] The federal government had to enact some plan to protect humans, particularly those working with livestock and their byproducts, from the disease. The commission tried to quantify the cost of human infection to highlight the burden of brucellosis and drive home the importance of public health to cattle owners who often focused on the economics of brucellosis infection. Though difficult to determine due to varying cost of health care, different durations and severity of illness, and indirect costs, the NBTC estimated that each case of human brucellosis cost on average more than $4,000.[13] By assigning a cost to human infection, the technical commission framed the impact of human brucellosis in terms that cattle owners and many animal disease researchers used when thinking about the benefits of eradication. The commission made the argument that having a state-federal program benefited both the health and economics of cattle and humans.

In addition to justifying why a brucellosis program was needed, the technical commission also determined if a control or an eradication program would actually work since the current program kept failing to achieve its goal of eradication. The question of biological feasibility and eradication had long divided the dairy and beef segments of the cattle industry and had been a topic of discussion at the recent congressional hearings. In its report, the National Brucellosis Technical Commission assessed that brucellosis could be eliminated and that no biological factor prevented this. The *Brucella* bacteria mostly spread through abortions and calving, and the only way to prevent abortions or infected cows

11 Ibid., 4.7-1.
12 Ibid., 4.5-1.
13 National Brucellosis Technical Commission, *Report: Appendix A* (Washington, D.C.: Animal and Plant Health Inspection Service, United States Department of Agriculture, 1978), A-25 – A-26.

serving as reservoirs involved preventing the infection in the first place.[14] Vaccines prevented brucellosis though none of them provided 100% protection. Most of them caused some vaccinated cattle to test as reactors, and cattle owners often overestimated their efficiency.[15] Despite its known limitations, strain 19 remained the best option for vaccination and reduced dose versions showed promise in reducing the number of false positives for testing.[16] The study also determined that cattle served as the primary reservoir of *Brucella abortus* and that while buffalo and elks in Yellowstone and greater Wyoming carried the disease and could pass it to domesticated cattle, no cases of this occurring had ever been documented.[17] Close surveillance of cattle near wild reservoirs could prevent reinfection from wild sources. With little chance of infection from wild sources, high chance of infection from diseased cows, and a vaccine with a success rate of 75% to 95% depending on the situations, the commission determined that brucellosis eradication was possible and if cases of the disease occurred, that a surveillance program prevented it from spreading to other animals.

The commission also used computer modeling, surveys, and state studies to determine feasibility of eradication and the cost benefit of each possible plan. This included the current program, programs similar to it with slight modifications, the USDA proposed ten year accelerated plan, and no state-federal program.[18] The computer modeling indicated that every plan for either control or eradication provided some degree of economic benefit while the model of no program led to increased brucellosis infection and economic hardship. Even the current program that drew the ire of many in the cattle industry and many animal disease control officials resulted in positive cost benefit compared to no program according to the computer simulation. Under the no program model, nineteen years after the end of the state-federal brucellosis eradication program 45% of dairy herds and 70% of beef herds

14 National Brucellosis Technical Commission, *Report: National Brucellosis Technical Commission*, 4.4-10 – 4.4-11.
15 Ibid., 4.4-14.
16 Ibid., 4.4-17.
17 Ibid., 4.4-2 – 4.4-3.
18 Ibid., 2-4 – 2-5.

would have enzootic brucellosis and the price of both milk and beef would increase.[19] The commission concluded that

> if there were not a cooperative state-federal program, uncoordinated state and individual programs would be initiated, which would prove more costly, interfere with commerce more than the existing program, and result in significant increases in the prevalence of bovine and human brucellosis."[20]

The simulations also demonstrated that calfhood vaccination provided better value than whole herd vaccination though in high prevalence areas herd vaccination and eliminating reactors reduced loss most effectively.[21] The computer modeling indicated that a state-federal cooperative program with flexibility to vaccinate or cull depending on the situation benefited the bottom line of cattle owners and that federal brucellosis control or eradication had to continue for the sake of the industry and public health.

While every scenario except no program demonstrated a cost benefit, the NBTC never created a vaccine only program. They tried to create a simulation using a model based on California's vaccination program after World War II, but determined that certified-free states would never allow for a vaccine only brucellosis program and that vaccination levels would never be high enough to influence infection rates across the nation. States in low prevalence areas had invested so much time and money into eradication effort and had imposed laws stricter than the existing Uniform Method and Rules that the commission thought these states would never allow the federal program to turn into a control through vaccination system.[22] As a result, they used the other models to investigate the impact of the vaccine including applying a vaccination variable that modeled vaccinations in specific areas to the other

19 Ibid., 5-12.
20 Senate Committee on Appropriations, *Brucellosis Eradication and Research: Hearing Before a Subcommittee of the Committee on Appropriations*, 96th Cong., 1st sess., 1979, 156.
21 National Brucellosis Technical Commission, *Report: National Brucellosis Technical Commission*, 5-10 – 5-11.
22 Ibid., 4.7-3 – 4.7-4.

programs.[23] With these variations, the researchers working on the computer modeling portion of the study determined that with the current program reinfection of certified-free herds would occur and with the ten-year accelerated program brucellosis would still be present after ten years due to reinfection and resistance to the program in some areas.[24] The most successful options seemed to be those that added variables into the base existing program like whole herd vaccination in high prevalence areas and increased funding for the program.[25] The computer simulations were not the sole method of determining the best course of action but did demonstrate that the existing state-federal eradication program could serve as a base for designing a new program.

According to the study, one of the flaws of the current program was the Uniform Method and Rules. Designed as a minimum standard for state eradication programs, many states created laws with more rigorous requirements. This effectively made fifty different state brucellosis eradication programs rather than one state-federal brucellosis eradication program. Each state had its own program, procedure, laws, and funding resulting in many different programs across the nation.[26] States that enacted legislation early often progressed to modified certified or certified-free status before their neighbors who lagged behind in adopting brucellosis eradication policies. States paid little attention to the existing or changing movement patterns of the cattle industry that enabled cattle to be transported from high prevalence to low prevalence areas. Instead, each local area or state focused on its own eradication plans and efforts.[27] In the 1970s, certified-free states focused on preventing reinfection leading to significant economic cost due to the restricted movement of cattle from modified certified states. In addition, the current UMR had high cost of surveillance especially in low prevalence areas where epizootic reintroduction of the disease could occur. The regulations offered little positive

23 Ibid., 2-4.
24 Ibid., 2-4 – 2-5.
25 Ibid., 2-5.
26 National Brucellosis Technical Commission, *Report: Appendix D* (Washington, D.C.: Animal and Plant Health Inspection Service, United States Department of Agriculture, 1978).
27 National Brucellosis Technical Commission, *Report: National Brucellosis Technical Commission*, 4.7-5.

incentive for cattle owners in high prevalence areas to eradicate enzootic brucellosis therefore allowing the reservoirs of reinfection to continue to exist.[28] The way the UMR developed and how each state implemented it generated two distinctly different areas of brucellosis eradication: the low prevalence areas where brucellosis existed as an epizootic infection and high prevalence areas where the disease had an enzootic baseline.

The National Brucellosis Technical Commission determined that a number of major problems damaged the current eradication effort and prevented it from being successful. These problems including inadequate knowledge, shifted responsibility, regulations based on inaccurate epidemiology, and the lack of flexible and specific individual herd programs that impacted the creation and modification of the Uniform Method and Rules and its application in each state. The commission targeted lack of knowledge among all constituents involved in the program and a lack of communication of information as a major reason the brucellosis eradication program had not been successful.[29] Not only did cattle owners, private veterinarians, state and federal veterinarians and health officials have to know about the disease and understand their role in the eradication effort, but the people involved in working with these groups including milkers, livestock handlers, transporters, auction market operators, cattle dealers, packers, meat inspectors, agricultural agents, public health officials, and physicians also had to know about the disease itself and their role in preventing it. Based on the testimony from hearings and position papers, responses to surveys, and analysis of program statistics the facts about brucellosis and its eradication had not been distributed to those participating in the program directly or tangentially.[30] Not only did cattle owners misunderstand aspects of the program or information about the disease, but so did private veterinarians who the extension services rarely

28 Ibid., 2-4.
29 Ibid., 4.8-3.
30 Ibid., 4.6-1.

targeted for education.[31] However, a survey of Texas cattle owners found that a significant portion of them relied on private veterinarians for their brucellosis information followed by information from friends and neighbors so private veterinarians needed to be included in government education efforts alongside producers and others involved in the cattle industry.[32] Word of mouth played an important role in brucellosis knowledge and everyone communicating about the disease needed a working understanding of brucellosis and the state-federal program.

During the course of the study, members of the commission noted that the current Uniform Method and Rules shifted responsibility from individual herd owners and private veterinarians to state and federal employees. In states where cattle owners and health professionals wanted brucellosis eradication, state and federal animal disease control officials took leadership of the program designed to benefit the local cattle industry, usually dairy farmers and government veterinarians, over for private veterinarians. In states where cattle owners opposed brucellosis eradication, the program often represented a government intrusion into the local cattle industry. Many cattle owners, particularly those in the South with beef cattle, saw no economic incentive for participating in the program run by the government and its agents.[33] In both situations, the program had little sense of ownership among producers. The NBTC wanted the eradication effort to be thought of in more local terms with leadership and demands for participation coming from cattle owners, state officials, and private veterinarians due to financial and social incentives.[34] This harkened back to the idea of each cattle owner focusing on his or her own herd and to derive area certification from the herd up to the area and state level rather than the area or state status impacting the certification and movement of individual herds.

31 Ibid., 4.6-4 – 4.6-5.
32 Ibid., 4.8-2.
33 Ibid., 4.8-4.
34 Ibid., 4.8-4.

During the course of the study, the National Brucellosis Technical Commission found that cattle owners in Southeastern and Central Southern including Florida, Louisiana, Texas, and Mississippi, states with the highest rate of infection, often opposed the brucellosis eradication cooperative and that the lack of participation in these states created a barrier to eradication.[35] These cattle owners often objected not just for economic reasons, but also on political grounds. They thought that the state-federal eradication program illegally intruded on their business and that the federal government had no right to interfere with the cattle industry by mandating testing or culling of animals. However, many cattle owners who perceived the eradication program to be a government intrusion still wanted the government to require and fund calfhood vaccination and fund indemnity.[36] Consistent with the long standing tradition of producers both accepting and rejecting federal government policies based on the economics of the situation as discussed in the first chapter, these cattle owners wanted no eradication program but wanted the government to fund the individual components of the program they thought to be beneficial to their herds and bottom lines. This mix of pushing against and demanding regulations and funding at the same time combined political and economic rationales, using a political argument to oppose the program they disliked and an economic one in support for the parts they did want. In addition to funding only the segments of the state-federal program that they liked, cattle owners and state animal health officials in Texas wanted Animal and Plant Health Inspection Service officials to focus on the diseases they thought caused the most loss. Screwworm reemerged in the Southwestern United States in the early 1970s and while it had mostly been contained by the end of the decade, an outbreak occurred in 1978 due to the wet and warm winter.[37] When questioned if cattle owners in his state would be an obstacle to brucellosis eradication, the Texas state veterinarian responded not with a

35 Ibid., 4.2-20.
National Brucellosis Technical Commission, *Report: Appendix E* (Washington, D.C.: Animal and Plant Health Inspection Service, United States Department of Agriculture, 1978), E-27 – E-29.

36 National Brucellosis Technical Commission, *Report: National Brucellosis Technical Commission*, 4.8-4.

37 James E. Novy, "Screwworm Control and Eradication in the Southern United States of America," Food and Agriculture Organization of the United Nations, http://www.fao.org/docrep/U4220T/U4220T0A.HTM (accessed March 03, 2013).

yes or no, but by writing "Screwworm" in the response box.[38] Members of the Texas Animal Health Commission recognized that for many cattle owners in the state screwworm infestation resulted in more economic damage than brucellosis and that they wanted the state and federal government operating in the area to invest their resources in eradicating the larvae as they had in the Southeastern United States rather than focusing on brucellosis eradication. For these cattle owners and local animal health officials ending screwworm infestations held priority over dealing with brucellosis.

In an attempt to gain the support of herd owners, the Uniform Method and Rules had been altered due to the lobbying of cattle owner groups. Each group had different demands for regulations depending on which part of the industry they represented. Dairy groups like the American Milk Producers, Inc. usually wanted stricter restrictions on eliminating reactors from herds though individual producers sometimes wanted relaxed regulations. Dairy producers who had reactors often demanded changes or flexibility in the UMR and state laws that allowed for them to keep reactor cows in quarantine conditions until they stopped lactating.[39] This created a rift between what policy dairy organizations lobbied for and what policy individual dairy producers with reactor cattle wanted. Beef cattle owners also had organizations that lobbied for changes to regulations on their behalf. Organizations like the American National Cattle Association successfully campaigned to reduce the testing requirements for animals moving within modified certified areas as discussed in the previous chapter. The Uniform Method and Rules along with state laws were subject to political pressures from all parts of the industry resulting in the implementation of regulations that proved to be epidemiologically unsound and allowed for reactors to remain in herds or for an increased chance of reinfection.[40] In addition, other sources of political issues such as protectionist trade policy, raw milk consumer interests, and state budget and funding debates all impacted the UMR and its implementation

38 National Brucellosis Technical Commission, *Report: Appendix E*, E-28.
39 National Brucellosis Technical Commission, *Report: National Brucellosis Technical Commission*, 4.7-1.
40 Ibid., 4.7-2, 6-1 – 6-2.

in states.[41] Instead of being derived from scientific principles as originally intended, the regulatory framework of the state-federal brucellosis eradication program ended up being altered or modified based on the politics of cattle and its economy and the demands of different groups.

While the NBTC criticized the current UMR for being overly influenced by politics and too disjointed and different from state to state, it also noted that the regulations had a lack of flexibility. This referred to individual and area flexibility for the UMR that allowed regulations to be tailored to the conditions of each herd or county it impacted based on the prevalence of the disease, herd management techniques, and cattle movement.[42] Every animal and herd in the program had to meet the same minimal requirements of the Uniform Method and Rules and cattle owners had no ability to adapt standards to eliminate brucellosis in a cost effective manner. The commission determined that any livestock disease eradication program that did not consider or compensate for the economic cost to herd owners would likely fail due to lack of support.[43] Cattle owners had to be able to mold the program to their needs and the economics of their herd. The technical commission believed that with greater flexibility resisting cattle owners would join the program, but this need for more options had to be balanced with the goal of eradication and preventing reinfection of certified-free herds.[44] The future brucellosis eradication program had to be standardized enough to actually achieve eradication and not a divided system while also being customizable on the local level to appease and suit individual herd owners.

In addition to improving the creation and regulatory process of the UMR, the commission also encouraged researchers and health professionals in both animal and human health to work together to improve the research, testing, and disease reporting. The USDA, experiment stations, and extension

41 Ibid., 4.7-1 – 4.7-3.
42 Ibid., 6-1.
43 Ibid., 4.9-1.
44 Ibid., 6-3.

services had to expand their work on brucellosis not only by communicating with private veterinarians and cattle owners as discussed earlier in the chapter, but also by increasing the amount of research conducted on brucellosis.[45] Through research the commission hoped that more accurate methods of testing and vaccination along with a greater understanding of the epidemiology of the disease would develop.[46] In addition, they wanted public health and animal disease control officials to rebuild a relationship in order to improve brucellosis understanding and reporting among physicians and veterinarians along with combining research efforts between health professionals and scientists working with the two populations. The lack of connection between the two types of health practitioners made a "sharp contrast to [the] level of intercommunication which characterized program activity in all parts of the country during the 1950's and early 1960's."[47] Those on the human health side wanting to prevent brucellosis had a vested interest in the animal disease control aspect since animals served as the disease reservoir for humans and those working with the animal eradication effort needed to know about human infection since the rate of brucellosis in animals directly affected the rate in humans. Members of the technical commission thought that public health and animal health workers had to band together to effectively address the threat of brucellosis since it was both epizootic and zoonotic.

Based on its extensive study, the National Brucellosis Technical Commission made eleven recommendations on how to address the problem of brucellosis in the United States. They suggested that brucellosis eradication was possible and economically desirable for the cattle industry and encouraged state and federal governments along with the industry to support a cooperative program aimed at local control leading to national eradication.[48] This support for the program also included occupational health and safety officials who needed the disease eradicated in animals in order to

45 Ibid., 4.6-5 – 4.6-6.
46 Ibid., 1-3.
47 Ibid., 4.6-6 – 4.6-7.
48 Ibid., 1-1 – 1-2.

prevent it in humans.[49] This program required educating cattle owners about why they needed eradication for economic and health reasons and how regulations benefited the industry.[50] In order to gain industry approval, the commission also advised that the program improve the indemnity payout system and reform the testing process to be more timely, effective, and less costly.[51] They also recommended that research at the current levels continue and that new findings that could improve the eradication program be evaluated and incorporated in a timely manner.[52] The NBTC also made a number of suggestions on ways to improve the existing program including supplying each animal changing ownership with an identification number to make it easier to trace reactor cattle back to their herds and changing the Uniform Rules and Methods to address the problems determined during the study.[53] In its report, the committee included a number of suggested revisions for the UMR intended to provide a better framework for the state-federal brucellosis eradication cooperative program.[54] The goals of these revisions were to shift the focus of the program back to individual and local responsibility for disease-free herds, utilize scientific knowledge and continuing research on brucellosis as the basis of program policy rather than politics, allocate resources to assist herd owners with infected cattle to establish disease-free herds while preventing reinfection, provide alternative guidelines and flexibility for cattle owners to manage their own herds in an efficient and economical matter while still achieving eradication, and improve government services that assisted herd owners with surveillance, diagnostics, and prevention.[55] The National Brucellosis Technical Commission hoped to use the existing program as the foundation of a new eradication program and provided recommendations for overhauling the system to address the concerns of all those participating in brucellosis eradication and

49 Ibid., 1-4 – 1-5.
50 Ibid., 1-1 – 1-2.
51 Ibid., 1-1, 1-6.
52 Ibid., 1-2 – 1-4.
53 Ibid., 1-4 – 1-6.
54 Ibid., 6-1 – 6-22.
55 Ibid., 6-2 – 6-3.

the problems they perceived had led to the failure of the current program.

Response to the National Brucellosis Technical Commission Report

The NBTC report made an immediate impact on the state-federal cooperative program in the United States though the process of adopting changes to the program and the UMR remained the same. Frank Mulhern, the administrator of APHIS, approved of the suggested changes but did not implement them.[56] Instead, he waited for the United States Animal Health Association to review the proposal and hear the input of cattle owners and state animal health officials about the proposed program. Without the support of state veterinarians and cattle owners the new program would never achieve eradication, and so the USDA waited for the proposed changes to proceed through the USAHA review process that allowed for input from participating constituencies. The association met in November 1978 to discuss the matter and recommended that the Department of Agriculture implement most of the changes suggested by the technical commission and endorsed the findings of the study.[57] With the USDA needing to approve the changes and states needing time to amend their laws and regulations to match the new UMR, APHIS expected that all of the changes would not go into effect until 1981.[58] Legally the changes still had to be adopted by both the state and federal governments, but most cattle owners and animal health professionals believed that the proposed changes to the program would be accepted at all levels of government.

The technical commission study, its results, and the proposed changes also started to restore cattle owners' faith in the program, helping to gain wider support for brucellosis eradication and regain the support the program had lost over the last decade. Herd owners, state animal health officials, and

56 "Raise Bang's Indemnity," *Hoard's Dairyman* 123, no. 12 (1978): 772.
"To Review Bang's Report, *Hoard's Dairyman* 123, no. 20 (1978): 1268.
57 Senate Committee on Appropriations, 41-43.
58 ""New Life" Seen in Drive to Wipe Out Brucellosis," *Hoard's Dairyman* 124, no. 1 (1979): 23.

veterinarians trusted the results of the National Brucellosis Technical Commission due to its scientific and comprehensive nature.[59] Before the review began, some beef cattle owners had worried about bias and a lack of understanding of their profession, but the way the Commission conducted its assessment and solicited information from all constituents involved or related to the eradication program helped assuage these fears as did the results. The fact that the commission acknowledged the problems of the program including its rigid nature on herd plans, the reliance on test-and-slaughter, and the use of limited types of testing made dairy and beef cattle owners feel as if someone actually listened to their concerns and wanted to change the program because of them.[60] Groups and state officials who resisted or questioned the state-federal program and the possibility of eradication, including the National Cattlemen's Association (NCA) and the Texas and Southwestern Cattle Raisers Association who had originally requested the NBTC study, became cautiously optimistic that beef producers would accept the new program and eradication would be achieved.[61] These organizations cautioned APHIS officials that the changes had to be fully accepted in order to receive and maintain the support of owners and that the new spirit of cooperation on both sides had to last. They asserted that "resentment and antagonism will not get the job done. Whole-hearted cooperation between cattle owners and regulatory officials is absolutely essential to ultimate success of any disease program."[62] Cattle owners worried that after the initial burst of action in response to the NBTC report that the program might revert to its former self with both dissatisfaction by cattle owners and antagonism between the USDA, state officials, and producers.

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59 Senate Committee on Appropriations, 148.

60 Senate Committee on Appropriations, 55, 90, 96, 97.
"Brucellosis Eradication Program," *The Cattleman* 66, no. 2 (1979): 134.

61 The American National Cattle Association changed its name in 1977 to the National Cattlemen's Association. The organization, originally founded in 1898 and named the National Live Stock Association, has been called the National Cattlemen's Beef Association since 1996.
Senate Committee on Appropriations, 31-45, 90.
"Brucellosis Eradication Program," 133-135.
"Cattlemen Urged to Retest, Vaccinate for Brucellosis," *The Cattleman* 67, no. 10 (1981): 40.

62 "Brucellosis Eradication Program," 133.

While many cattle owners, including a number who had previously resisted the program, welcomed the changes to the state-federal brucellosis eradication program and hoped that the new program would garner more industry support, some cattle owners who resisted the program accepted that they would have to comply with the new program despite their lack of enthusiasm for it.[63] The program had such wide support among herd owners, organizations that lobbied for the cattle industry, and animal health officials that the die had been cast for acceptance of the new state-federal brucellosis eradication program. Not all cattle owners who still objected to the brucellosis eradication program just accepted that they would have to comply with the changed regulations. Pursuing legal options before the implementation of the new program, Texas cattle owner R. J. Nunley, who had sued the Texas Animal Health Commission over the brucellosis program a decade earlier and ultimately lost, filed another lawsuit in 1979 to prevent the TAHC from entering his farm and testing his cattle.[64] Arguing that testing did more harm than good and that inspectors agitated the herd, Nunley won an injunction against the state in August 1979 based on the grounds that the Texas brucellosis eradication program was unconstitutional, but only as it applied to him.[65] Due to a procedural issue, no appeal of the decision was ever granted and the injunction became permanent.[66] The Texas brucellosis eradication program continued since the court had not declared the entire program unconstitutional, but the courts carved out an exception to the laws enforcing brucellosis eradication regulations just for one cattle owner.

Reluctant cattle owners were not the only group worried about the effect of the proposed

63 Senate Committee on Appropriations, 91.

64 Nunley not only sued to stop the TAHC from inspecting his cattle, but also the cattle he co-owned with former Texas governor Dolph Briscoe.
"Industry Looks to USAHA for Stance on Brucellosis," *The Cattleman* 66, no. 5 (1979): 33.
Jeffrey H. Birnbaum, "Rift Over Inspections of Texas Cattle Spurs a Quarantine Threat: U.S. Issues Warning in a Bid to Toughen State Law; Deadline Is Wednesday," *Wall Street Journal*, May 26, 1983.

65 "Brucellosis Major Developments in 1982," *The Cattleman* 68, no. 8 (1982): 38.

66 *Texas Animal Health Commission v. R. J. Nunley*, 598 Southwestern 2nd, 233 (Supreme Court of Texas, 1980), 233-234, http://scholar.google.com/scholar_case?q=nunley+AND+Texas+AND+Brucellosis&hl=en&as_sdt=2,44&case=12871537747257216899&scilh=0 (accessed March 5, 2013).

changes to the brucellosis eradication program. The NBTC targeted livestock marketers, the people who owned markets and auctions, and suggested that they be licensed and monitored to prevent the spread of brucellosis. By making places that sold cattle be licensed, the state could pull these licenses if it found the markets or auctions to be selling infected cows or skirting the UMR regulations. By adding in a licensing requirement, the government had the power to create positive and negative incentives for complying with state and federal regulations. Livestock marketers claimed that the new rules would prevent the movement of cattle, impact their livelihood, and that the industry already faced strict enough regulations without licensing.[67] The Livestock Marketing Association, which represented market and auction owners, worried that requiring registration and licensing along with changing definitions and mandating more record keeping and identification would effectively halt the movement of cattle.[68] While they had concerns about the new regulations, the marketers conceded that they would follow the lead of their customers, beef cattle producers, and their confidence in the changing eradication plan.

The changes to the eradication program, a new spirit of cooperation, and greater acceptance of the state-federal cooperative effort made brucellosis eradication a viable prospect, but it also needed funding from states and the federal government. While the NBTC had designed their suggestions with economics and efficiency in mind, the new program still required an increased level of funding to cover the cost of more testing, market flexible indemnity, and quicker tracebacks. Supporters of the increase in funding noted that while the government had spent about $2 billion on brucellosis control and eradication since the 1930s, it has not succeeded due to the lack of cooperation, organization, and coordination between states and the federal government.[69] The state-federal brucellosis eradication program existed with relatively little funding considering the amount of testing, indemnity, and

67 Senate Committee on Appropriations, 71.
68 Ibid., 73.
69 Senate Committee on Appropriations, 27.

veterinary support associated with the program. In 1976, annual spending on the program topped out with $15.5 million supplied by the federal government and $338.6 million funded by states.[70] In order to increase program activity to the desired level, supply cattle owners with indemnity approaching the value of the animal, and help states cover the cost of the required regulations of the UMR, the Animal and Plant Health Inspection Service asked for $94.3 million a year for the program and the USDA asked for $69.9 million a year.[71] Congress decided to progressively increase funding as more states got involved in the process, approving $77.7 million for the 1980 fiscal year, $80 million for the following year, and $90 million for fiscal year 1982.[72] The federal director of the brucellosis eradication program argued that the increase of funding was money well spent compared to the cost of continuous brucellosis infection.[73] They had earmarked much of the new funds to jump-start the program in high prevalence areas in the South and program officials believed that only with the increased federal funding would the program succeed.[74] States like Florida and Texas also volunteered to increase brucellosis eradication spending and most cattle owners supported any funding increases that resulted in having to pay less for brucellosis eradication.[75] Congress approved a three-year ramp up in funding as the Department of Agriculture and states implemented the suggested changes to the brucellosis eradication program in hope that more money would finally lead to the end of the disease in cattle.

The first round of changes to the Uniform Method and Rules regulation went into effect on September 4, 1979, though APHIS gave states time to comply with the new standards. Paul Becton, the agency's director, urged “leaders of the livestock industry and state animal health agencies to push for

70 National Brucellosis Technical Commission, *Report: Appendix D*, D-5
71 Senate Committee on Appropriations, 8.
72 “Texas Animal Health Commission Information on the Brucellosis Program in Texas,” *The Cattleman* 66, no. 6 (1979): 180.
“Federal Brucellosis Eradication Funds Distributed Unevenly,” *Hoard's Dairyman* 127, no. 20 (1982): 1341.
73 Senate Committee on Appropriations, 9.
74 Ibid., 12.
75 Ibid., 104, 144.
“Brucellosis Eradication Program,” 135.

early implementation of the revised UMR measures" along with more education in order to encourage participation and eliminate the disease.[76] Though the USDA gave states and cattle owners more time to comply with the rules, they encouraged people to start the new program sooner so that, as cattle owners rebuilt their herds, they reduced the chance of spreading *B. abortus*. The new UMR included many regulations aimed at addressing the issues cattle owners had with the program in the mid-1970s and the problems identified by the technical commission. Under the new method and rules, all test-eligible cattle from non-certified or modified certified areas with unknown brucellosis status had to be tested or S-branded to prevent them from being sold for anything but slaughter, dealers had to be registered and keep detailed records so reactors could be traced back to their original herds efficiently, only infected herds in high risk areas would be eligible for whole herd vaccination, and cattle shipped interstate from modified certified states would require a permit of entry from the state and be quarantined for 45 to 120 days until retested.[77] Several terms and regulations gained clarification or new definitions such as herd and test-eligible cattle. Herds became a group of cattle separated into defined units, unable to mix with other herds so that cattle owners could not swap cattle from herd to herd to prevent quarantines. The age of eligibility for testing of non-official vaccinate dropped to 18 month for all types of cattle, a compromise between dairy industry representatives who wanted 12 months and beef industry representatives who wanted to maintain the old 24 month standard.[78]

APHIS also approved the suggestion of individual herd plans that allowed for flexibility for cattle owners when dealing with reactors in their herds. Cattle owners who had cattle test positive as reactors to *B. abortus* had to develop a plan for eradicating the disease within the herd in consultation

76 "USDA Announces Changes in Brucellosis Eradication," *The Cattleman* 66, no. 4 (1979): 31.
77 Ibid., 30-31.
"More Cattle Will Be "S" Branded Under Tough Brucellosis Rules," *Hoard's Dairyman* 125, no. 3 (1980): 202.
78 "More Cattle Will Be "S" Branded Under Tough Brucellosis Rules," 202.

with their veterinarian and the plan had to be approved by the state animal health official.[79] This not only gave producers more flexibility on how to manage their own cattle, but placed the responsibility for eradicating the disease on the cattle owner and his or her private veterinarian as advocated by the technical commission. State governments still had the last word if a herd plan constituted a valid method of eradication since they approved the plan, but producers and veterinarians had the ability and the responsibility to determine the best method of accomplishing brucellosis eradication.

The new UMR also established a new method of classifying states in the brucellosis program based on their rate of infection. This system eliminated the certified-free and modified certified standards and replaced them with a lettering system that allowed for finer distinctions based on the prevalence of bovine brucellosis and addressed the complaint that certified-free areas still could have cases of brucellosis. Intended to start in January 1982, Class A states had no brucellosis infection for more than twelve months except for cases of reinfection that had not spread. In Class B states, infection herd rates had to be under 1%, and any state with a greater rate gained the label Class C. Cattle from Class A states had no testing requirements while those from Class B and Class C states had various levels required for change of ownership or movement. Certified-free herds in all areas had no testing requirements.[80] The new classification scheme allowed for individual herds to be considered disease-free even outside of Class A areas reestablishing the compromise established with the UMR changes of the late 1960s to prevent all cattle in non-certified areas from being painted as diseased regardless of herd status. The herd health status mattered, not just the brucellosis status of the area where the herd resided, encouraging cattle owners who wanted clean herds to eliminate the disease even if their neighbors did not.

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79 Ibid., 203.
"USDA Announces Changes in Brucellosis Eradication," 30-31.

80 "Texas Animal Health Commission Information on the Brucellosis Program in Texas," 188-189.
"More Cattle Will Be "S" Branded Under Tough Brucellosis Rules," 203.

After the initial changes approved by the United States Animal Health Association and then adopted into the Uniform Method and Rules by APHIS, the UMR continued to be modified over the next three years based on the demand of state animal health officials, cattle owners, the NBTC, and the Department of Agriculture. At its October 1979 meeting, USAHA recommended changes to the state-federal brucellosis eradication program including allowing states to divide in order to create multiple classification areas and clarifying the rules governing the movement of adult vaccinates.[81] The Texas Animal Health Commission requested the ability to divide the state into different classifications as it had during the earlier eradication effort and states and cattle owners in high prevalence areas who could vaccinate whole herds under the new regulations wanted definitive rules about moving their animals.[82] In March 1980, the Department of Agriculture announced easing restrictions on quarantine pastures, feedlots, dealers, and adult-vaccinated cattle to allow for more efficient movement of cattle while still preventing the spread of disease.[83] The following year, prompted by cattle owners, states, and APHIS, the USAHA and then the USDA modified and delayed the start of the new classification system. Adding a new category, Free, to define states with no cases of bovine brucellosis in the last year, the revised classification shifted the meaning of Class A to states with a herd infection rate of 0 to 0.25%, Class B to 0.25% to 1.5%, and Class C to 1.5% or higher.[84] This meant that a Free state would not have cases of brucellosis that had been reintroduced but not spread in the herd, establishing a classification that indicated an area with total eradication unlike the previous classification of certified-free. The Department of Agriculture delayed the start of the classification program from January 1982 to the end of the year so that they had more time to evaluate state data and determine the status of each

81 "USAHA Approves Changes to Brucellosis Program Rules," *The Cattleman* 66, no. 7 (1979): 29.
82 "Convention 1980: Animal Health Committee," *The Cattleman* 66, no. 11 (1980): 152.
83 "States' Brucellosis Standards Amended by USDA Action," *The Cattleman* 66, no. 12 (1980): 25.
84 "Brucellosis Major Developments in 1982," 37-38.
"New State Bang's Classes Are Now in Effect," *Hoard's Dairyman* 127, no. 22 (1982): 1493.

state or area within the state.[85] Most of the constituents who participated in brucellosis eradication had accepted the new state-federal program and the changes to the UMR, but they still wanted to continuously evaluate the program and modify it in order to ensure its efficiency and economic advantages.[86] While the NBTC hoped to avoid modifying the rules based on politics and economics as had happened in the past, they also recognized the need to cooperate with states and the cattle industry in developing regulations. Balancing the need for eradication, the science of brucellosis, the economics of eradication, and the demands of the groups involved in the state-federal program remained an area of tension in the new eradication effort.

In order to encourage involvement by cattle owners and meet the demands of the industry, the USDA changed its indemnity policy in 1980. Previously, cattle owners had been paid a flat indemnity amount based on the type of breed and pedigree of the reactor to be slaughtered along with the salvage price. Adjusting the rates required changes in the UMR and state laws, making them relatively difficult to shift in response to market changes in cattle prices and the amount paid often covered only a fraction of the cost of purchasing replacement cattle. Recommended by the National Brucellosis Technical Commission, the new indemnity program accounted for moving market prices by adjusting payment amounts to ensure that cattle owners received about 90% of the cost of replacing an animal.[87] Cattle who tested as reactors received a B brand and had to be sold for slaughter within 15 days. Cattle owners received money for selling these animals to slaughter along with indemnity from the federal government and in some states, from the state brucellosis eradication program. The Department of Agriculture wanted the total amount received by a reactor's owner to be almost enough to cover the

85 "New State Bang's Classes Are Now in Effect," 1493.
"USDA Postpones Starting Date for Sate Brucellosis Classification, *The Cattleman* 68, no. 9 (1982): 21.
"New Bang's Ratings Postponed by USDA," *Hoard's Dairyman* 127, no. 7 (1982): 548.

86 "Resolutions," *The Cattleman* 66, no. 11 (1980): 156.
"Committee Appointed for Texas Brucellosis Program," *The Cattleman* 68, no. 2 (1981): 22.
"Cargile Endorses Proposed Changes to Federal Brucellosis Program," *The Cattleman* 68, no. 2 (1981): 64.

87 "USDA Revising Indemnities for Brucellosis Loses," *The Cattleman* 66, no. 12 (1980), 25.

cost of getting a new animal in order to encourage owners to slaughter rather than quarantine or try to illegally move their cattle.[88] The cost of the new indemnity system quickly became a problem as the value of livestock continued to rise in the early 1980s. In spring of 1981, the USDA reduced indemnity to assure that the $15.7 million fund would last the rest of the fiscal year and in June Congress approved another $3 million to restore full indemnity.[89] By addressing the issue raised by cattle owners during the 1970s of not being able to replace brucellosis culled cattle, the state-federal brucellosis eradication program increased economic incentive for the test-and-slaughter portion of the program. However, since the new indemnity was tied to the market price of cattle, the cost of cattle became a budget issue for the indemnity fund and the eradication program.

Continued research and new technology also impacted the UMR between 1979 and 1981. The Department of Agriculture, agriculturally focused universities, experiment stations, and cattle owners themselves experimented with better methods of testing, immunization, and understanding the epidemiology of brucellosis.[90] In September 1980, the USAHA suggested allowing cattle to be vaccinated with a reduced dose of strain 19 vaccine. Testing by the government, universities, and in the field indicated that the lower dose caused fewer animals to react to agglutination testing and provided for greater immunity.[91] Many cattle owners and southern states pushed for the new vaccine due to the reduced risk of vaccinated reactors and because it allowed a greater age range for vaccination. By the next month, the Uniform Method and Rules had been amended to allow for female calves aged four months to twelve months to be vaccinated with the new dose.[92] Vaccination rates had already increased in 1980, but the lower dose vaccine and new age limits increased use even further. In the last quarter of

88 "USDA Offers Revised Brucellosis Indemnity," *Hoard's Dairyman* 125, no. 10 (1980): 751.
89 "Animal Health Developments Announced to Cattlemen by APHIS," *The Cattleman* 68, no. 1 (1981): 21. "U.S. Restores Livestock Funds," *New York Times*, June 13, 1981.
90 "Overview of Brucellosis Research at the Texas Agricultural Experiment Stations," *The Cattleman* 66, no. 10 (1980): 160-161, 172-178.
91 "USAHA Recommends Changes to Federal Brucellosis Program," *The Cattleman* 66, no. 7(1980): 29.
92 "Reduced Dosage Receives OK for Fight Against Brucellosis," *The Cattleman* 67, no. 6 (1980): 22-23. "Reduced Dosage Strain 19 Now Available," *Hoard's Dairyman* 125, no. 21 (1980): 1434.

1980, after the new UMR regulations went into effect, calfhood vaccination rose 30% nationwide and almost 100% in the high prevalence state of Texas.[93] In both dairy and beef areas state animal health officials and veterinarians urged cattle owners to vaccinate their animals.[94] Most states and cattle owners embraced the new vaccine, but the reduced dose required state laboratories to dilute the already existing vaccine and many states could not handle this requirement or needed to wait for changes in state law before proceeding. To remedy this problem, the Department of Agriculture allowed commercial vaccine manufactures to produce the vaccine and within a few years, Burroughs Wellcome became the first company licensed to sell reduced dose strain 19 vaccine allowing 16 more states who lacked the proper state facilities to switch to using the new vaccine.[95] This marked the first time private companies were allowed to manufacture brucellosis vaccine since the ban in the 1930s. They still could not market their own vaccines as companies had in the early twentieth century, but the new regulation shifted the burden of vaccine production from the government to private industry.

By the early, 1980s most states had adopted the new UMR for the brucellosis eradication program into their state laws and the program had general support from states and the industry because of its flexibility, affordability, practicality, and since it had been based on the scientific study conducted by the NBTC.[96] Even states where the program previously faced opposition from cattle owners saw a greater degree of participation and support under the new accelerated brucellosis eradication program. In Texas by the middle of 1981, the vaccination rate had increased greatly with nearly 25% of all

93 "Calves Vaccinated for Brucellosis Up 16 Percent to 5.9 Million," *Hoard's Dairyman* 126, no. 3 (1981): 164.
"Bang's Vaccination Up," *Hoard's Dairyman* 126, no. 13 (1981): 962.
"Revised Brucellosis Program Causes Vaccination Increase," *The Cattleman* 67, no. 11 (1981): 33.

94 "There Are Good Reasons for Brucellosis Eradication," *Hoard's Dairyman* 126, no. 22 (1981): 1563.
"Reduced Dosage Receives OK for Fight Against Brucellosis," 23.
"Cattlemen Urged to Retest, Vaccinate for Brucellosis," 40.

95 "License Issued for New Bang's Vaccine," *Hoard's Dairyman* 128, no. 19 (1983): 1247.

96 "Cattlemen Urged to Retest, Vaccinate for Brucellosis," 40.
House Committee on Agriculture, *Brucellosis Eradication Budget Proposal: Hearing Before the Subcommittee on Livestock, Dairy, and Poultry*, 97th Cong., 2nd Sess., June 22, 1982, 7.

eligible calves vaccinated and 91% of all markets voluntarily tested eligible cattle before sale.[97] Some speculated that participation in the program had only increased due to fear of not being able to sell or move cattle interstate, but economic consequences had been one of the incentives the NBTC recommended Animal and Plant Health Service use to make cattle owners take an interest in eradication.[98] Whether cattle owners supported eradication and cooperated with the state and federal governments for the economics of increasing calf and milk production or the economics of the restrictions placed on non-certified herds and cattle, more cattle owners participated in the program. By 1982, only 0.04% of cattle in the country tested positive as reactors.[99] In the early 1980s, brucellosis eradication seemed possible under the new program and the NBTC guided changes. However, problems with the brucellosis eradication program developed in 1982 and 1983 as the Reagan administration pushed to reduce funding for brucellosis eradication and the USDA threatened once again to quarantine all cattle from the state of Texas.

Politics and the State-Federal Brucellosis Eradication Program

During the last third of the twentieth century, the conservative political movement in the country gained ground by uniting the original American New Right and the growing evangelical renaissance to form a second New Right movement that mixed conservative economic and social principles.[100] This coalition captured the attention of voters frustrated with the government in the post-Watergate era. Inflation, unemployment, and the cost of gas upset many Americans and shifted public

97 Texas Animal Health Commission, *Texas Brucellosis Program Highlights Past and Present*, (Austin, TX: The Commission, 1981), 1, Texas and Southwestern Cattle Raisers Association Records, Box 2010-128/1, Folder – Animal Health Committee 1981 Annual Convention – Fort Worth March 29 – April 1, Dolph Briscoe Center for American History, University of Texas at Austin.
"Cargile Endorses Proposed Changes to Federal Brucellosis Program," 64.

98 "Cargile Endorses Proposed Changes to Federal Brucellosis Program," 64-65.
National Brucellosis Technical Commission, *Report - National Brucellosis Technical Commission.*

99 House Committee on Agriculture, 12.

100 James L. Roark et al., *The American Promise: A History of the United States Volume 2 from 1865* (Boston: Bedford/St. Martins, 2012), 1019-1021.

opinion towards conservative candidates and government reforms starting in the 1970s.[101] In its report, the National Brucellosis Technical Commission noted that "it is also necessary to recognize that there is now a strong public push to reduce the extent of governmental regulations in the private sector" and that the politics of small government affected the effort to eradicate brucellosis.[102] If the prevailing political mood of the country was to reduce federal involvement then the state-federal eradication program leaned more heavily on the state and producers rather than the federal government. The election of Ronald Reagan and a Republican majority in the Senate in 1980 indicated that in general the country had shifted to a more conservative mindset.[103] In 1982 as the new accelerated brucellosis eradication program gained momentum and received its largest amount of federal funding, the Reagan administration proposed reducing the amount of money Congress provided for the program from nearly $91 million in fiscal year 1982 to approximately $60 million in fiscal year 1983, $26 million for the following year, and only $6 million for every year after that. The Office of Management and Budget (OMB) claimed that the brucellosis eradication program operated as subsidy for cattle owners and that states and industry should cover most of the cost for the program.[104] With only about $40 million in loss each year due to brucellosis, the cost of the program exceeded the economic burden of the disease in the United States making it a target for budget cuts.[105] This point of view about the program as a subsidy and the need to cut the federal budget rose from the administration's belief in small government and its policy of cutting the federal budget.[106] The concept that the brucellosis eradication existed as a subsidy to cattle owners dated back to the original use of funds to cull diseased cattle during the Great Depression and had been an argument against a federal program in the 1940s by range

101Paul S. Boyer et al., *The Enduring Vision: A History of the American People* (Lexington, MA: D.C. Heath, 1996): 1034-1038.
102National Brucellosis Technical Commission, *Report - National Brucellosis Technical Commission*, 4.7-3.
103Paul S. Boyer et al., 1040-1041.
104House Committee on Agriculture, 1-2.
105Ibid.,113.
106Roark et al., 1021.

cattle owners. The OMB did not want to entirely eliminate the state-federal eradication program like earlier critics, but wanted to shift the responsibility for funding from the federal government to states and the private sector.

The Department of Agriculture created an eradication program that followed the funding reduction mandate of the OMB in 1982. Aimed at forcing the private sector to take more responsibility for the program through financial burden, the proposed budget for fiscal year 1983 included cutting federal funding for indemnity and fees to veterinarians for vaccinations.[107] The bulk of federal funds would focus on the areas with the majority of brucellosis infected herds - East Texas, Louisiana, Mississippi and South Florida - in order to eliminate enzootic brucellosis that threatened to reinfect cattle in other areas.[108] The budget proposal developed in conjunction with states, APHIS, the NBTC, and segments of the cattle industry in order to prioritize the program's budget and assure funding for what these groups perceived to be the most essential part of the state-federal cooperative. These groups that made up the Brucellosis Policy Review team prioritized parts of the program including primary surveillance and handling infections as top priorities and fee-based calf vaccinations and regular indemnity as the lowest priorities for federal funding.[109] This statement of priorities was reflected in the final proposal that cut indemnity and veterinarian fees for vaccinations. The constituents who had been directing brucellosis eradication efforts throughout the twentieth century continued to dictate the terms of the state-federal eradication effort even when it came to the budget of the program. C.W. McMillan, the USDA Assistant Secretary for Marketing and Inspection Services, testified before Congress about the unprecedented nature of a government agency calling on industry and states to determine how the federal government set its priorities for budgets cuts.[110] The cooperative nature of animal disease

107House Committee on Agriculture, 12 -13.
108Ibid., 13.
109Ibid., 16.
110Ibid., 12.

eradication allowed private industry and state animal health officials to have increased control over federal budgets outside of lobbying and action through members of Congress.

While budget priorities for the proposed USDA budget for brucellosis eradication arose from the demands of the cattle industry, veterinary medical professionals, and state animal health officials, many cattle owners, veterinarians, and health officials opposed the proposed reduced budget of the state-federal cooperative.[111] However, the reasons for disagreeing with the program tended to divide along the traditional industry related lines with dairy cattle producers rejecting reduced funding while beef cattle producers wanted a reduction in bureaucracy and no changes to services like free vaccines for cattle owners. After the USDA published the proposed new budget, the House called a hearing due to worries that the proposal may have come in a rush after the OMB mandated the reduction in brucellosis eradication program costs. Congressional representatives, industry groups, and state animal health officials who testified brought up concerns about how the USDA developed the proposed cuts and their impact on the eradication effort. Many dairy cattle trade organizations, veterinary medicine groups, state animal health officials, and representatives from low prevalence states, questioned the Office of Management and Budget's decision to require funding cuts. They thought the agency had either ignored the NBTC study that called for more funding and the success seen in the few years since it had been implemented or did not recognize the public health cost of brucellosis. These groups feared that a reduction of funds would lead to control rather than eradication and leave the program where it was in the 1970s.[112] Instead of saving money by cutting funds now, they saw the money saved by not living with the disease once eradication occurred as the reimbursement to taxpayers for funding the program.[113] While APHIS estimated the current cost of brucellosis on the livestock industry at $40 million a year, the agency determined that the proposed cuts could result in $1 billion in brucellosis

111Ibid., 63.
112Ibid., 52, 66, 100, 193.
113Ibid., 81.

losses each year due to the spread of the disease.[114] Cutting the brucellosis program would allow brucellosis to return to its enzootic state and cost the United States economy a billion dollars as the disease spread in the cattle population.

Due to the threat of increased brucellosis infection and the economic loss related to it, Representative Tom Harkin of Iowa noted that the cattle industry and states had been reluctant to accept financial responsibility for the program in the past and that since brucellosis constituted a national economic and public health problem, the federal government had to direct and finance the eradication effort.[115] Despite still being enzootic in some areas, brucellosis posed an epizootic disease threat to both the livestock and human population. Along with the cost of the disease to the industry in the country and the public health risk it presented, countries that had eliminated or nearly eliminated brucellosis such as Canada threatened to place restrictions on American cattle if the United States reduced funding for testing and eradication.[116] As the rest of the world moved to end brucellosis, the United States faced the prospect of losing its export market for cattle just as it had with previous cattle diseases like contagious bovine pleuropneumonia. No voluntary programs had led to disease eradication since, while cattle owners could eliminate a disease in their herds, they could not eliminate it in their neighbors' herds.[117] This basic tenet of animal disease control meant that the federal government had to operate the brucellosis eradication program in order to achieve national eradication. Numerous state animal health officials from low prevalence states also thought that reduced federal presence in the program would lead to the same problems with the program that existed before the technical commission report. The country would have 50 individual programs making nationwide

114Ibid., 19.
115Ibid., 38.
116Ibid., 35.
117Ibid., 82.

eradication and interstate commerce difficult.[118] They worried about the feasibility of eradication under the new cuts and pointed out that the cost of constant surveillance and fighting reinfection in brucellosis-free states would cost more than the amount saved by the budget cuts. Trying to eradicate the disease in the future once it had a foothold in the cattle population and it presented a more significant economic and public health threat would also cost more than just eradicating it at the moment when most herds had already been rid of brucellosis.[119] The American Veterinary Medical Association agreed with the state animal health officials and protested cuts that might prevent eradication.[120] Groups that wanted the brucellosis eradication program to keep its full funding saw the Office of Management and Budget's call to reduce federal funding as a move away from national eradication and back towards the old program.

Not all cattle owners, veterinarians, and state animal health officials thought brucellosis eradication funding cuts would hamper the effectiveness of the program, but they wanted to target certain areas for elimination such as parts of the program they disliked while keeping the ones that benefited them economically. The National Cattlemen Association, a nationwide beef industry organization, thought that the increase in funding for the brucellosis program led to more bureaucracy. They endorsed cutting the program's budget to eliminate what they saw as red tape including personnel, administrators, and overhead, and leaving the funding for what they saw as vital components of the program such as indemnity, vaccines in Class B and C areas, and first point concentration testing in high prevalence areas. The NCA rejected the OMB's rationale that these programs represented unwarranted subsidies to cattle owners. Just as those who endorsed no cuts to the brucellosis eradication program budget, the organization cited the National Brucellosis Technical Commission report as to the feasibility of eradication and why the parts of the program targeted for reduced funding

118Ibid., 1982, 129, 121, 144, 153.
119Ibid., 116.
120Ibid., 96-97.

were necessary to achieve eradication.[121] Most of the beef cattle industry no longer rejected the possibility of eradication, they just wanted costs to cattle owners to be compensated while reducing bureaucracy that they saw as a burden to the industry and the eradication program. Many animal health professionals agreed with the NCA that the USDA could make cuts from the state-federal brucellosis eradication program but not in the manner under consideration. Representatives from both the United States Animal Health Association and the American Veterinary Medical Association testified that the program could save some costs but not as the OMB suggested, and they questioned why the Reagan administration rejected the suggestions of the NBTC, a committee of respected scientists.[122] State animal health commissions and state cattle owner associations that supported cuts to federal funding also wanted different cuts made and stated that the proposed cuts arose from scientifically false information.[123] The Department of Agriculture noted that they consulted with scientific and veterinary medicine advisers like the NBTC and USAHA when developing the budget, but these organizations had disagreements about what to cut and the proposed program budget represented a compromise.[124] The USDA made budget cuts due to the OMB demands and tried to eliminate funding based on the priorities of the constituents involved in the brucellosis eradication program. However, most of these groups either rejected the reasons for budget cuts or if they accepted a reduced budget wanted different areas of the program cut. Both groups insisted that science be used to direct funding decisions and that the proposed state-federal brucellosis eradication program budget lacked a scientific foundation that would allow the nation to achieve the goal of brucellosis eradication.

In addition to modifying the budget of the state-federal eradication program, the USDA proposed changing some aspects of the program and entering the UMR into the Code of Federal

121Ibid., 41.
122Ibid., 96-101.
123Ibid., 131, 136, 137, 139161, 163.
124Ibid., 19, 39.

Regulations order to change the national regulations for cattle moved interstate.[125] The modifications to the UMR and the Code of Federal Regulations included using card testing for market cattle identification of brucellosis reactors, decreased flexibility for herd plans, and requiring cattle owners who wanted to protest the status of their herd to sue rather than have an administrative hearing in order to reduce costs along with stricter testing and record keeping to prevent reinfection of disease-free herds.[126] Some beef cattle owners and representatives from majority beef states like Montana worried that the restrictions that came with the new plan "encroach[ed] upon the freedom of the industry to an unbearable degree."[127] John Armstrong, the chairman of the Texas Animal Health Commission, warned the USDA that "the proposed rules will destroy cooperation of Texas herd owners because of their rigid and overly regulatory tone."[128] Cattle owners wanted an eradication program, but not one that impacted how they operated their ranches and farms. These cattle owners continued to believe in the producer as an independent, free entity who did not need the government telling him or her how to conduct his or her business.[129] This not only constituted a continuation of cattle owners' perception about the link of cultivators to freedom, but also fit with the current national political mood of rejecting government regulations and bureaucracy. The proposed changes not only violated the spirit of cooperation needed to make the program successful, but also violated what many beef cattle owners perceived to be the individualistic nature of cattle raising.

Cattle owners who questioned the changes to the UMR and their inclusion into the Code of Federal Regulations also voiced concerns about what they saw as a rejection of science. This included the use of card testing as the official test for identifying cattle sold at market since researchers and experience had demonstrated the limitations of the test and the NBTC had rejected card testing as an

125"Resolutions," *The Cattleman* 68, no. 11 (1982): 165.
126"TAHC Appeal Brucellosis Ruling," *The Cattleman* 69, no. 2 (1982): 21.
127House Committee on Agriculture. 12.
128"TAHC Appeal Brucellosis Ruling," 21.
129"USAHA Backs TSCRA's Stand on Brucellosis," *The Cattleman* 62, no. 7 (1975): 21.

effective stand-alone method of testing cattle in the program. In addition, by accepting the card test as the definitive diagnostic test in the MCI program, the USDA hampered participation in the vaccination portion of the eradication program because of fear over the rate of false reactors due to the vaccine associated with the card test. By early 1983, 20 states had enacted laws requiring that all eligible cattle entering the state be vaccinated against brucellosis.[130] With vaccination becoming a requirement to move cattle in some areas, cattle owners and state animal health officials worried about any actions that may interfere with the participation of cattle owners in state vaccination programs. The new Department of Agriculture recommendations for both the UMR and federal regulations ignored cattle owners' concerns about condemning brucellosis-free cattle as reactors using the card test and the impact of card testing on vaccination rates. Cattle owners who opposed the changes to the eradication program rules also rejected limiting the flexibility of individual plans and the power of state epidemiologists to determine the best course of action for a diseased herd along with the herd owner and his or her veterinarian. These cattle owners wanted epidemiologists to make decisions based on scientific criteria but have the flexibility to tailor the plan to each herd rather than have one or two options set by the UMR.[131] This desire for freedom in herd plans matched the recommendations of the technical commission report and demonstrated that the Department of Agriculture had moved away from the suggestions of the committee that had been adopted to gain support of the industry and eradicate the disease. The new USDA plan for the state-federal eradication program threatened industry support for the cooperative effort due to the reductions in funding and the proposed changes to the operational mechanism of the program.

Despite complaints by most of the constituents involved in brucellosis eradication, the budget to the program was reduced to about $60 million for fiscal year 1983. With the administrative cost staying

130“Only Bang's Vaccinates Can Enter 20 States,” *Hoard's Dairyman* 127, no. 11 (1982): 825.
131“Texas Animal Health Commission Rejects Brucellosis Rule Changes,” *The Cattleman* 69, no. 1 (1982): 21.

the same at about $11 million, this meant less money went to the states to help reimburse costs for vaccines, testing, indemnity, and state epidemiological services.[132] This increased the economic burden on cattle owners and states while still requiring them to participate in the brucellosis eradication program. At the end of 1982, the new classification went into effect, creating four types of brucellosis rated areas.

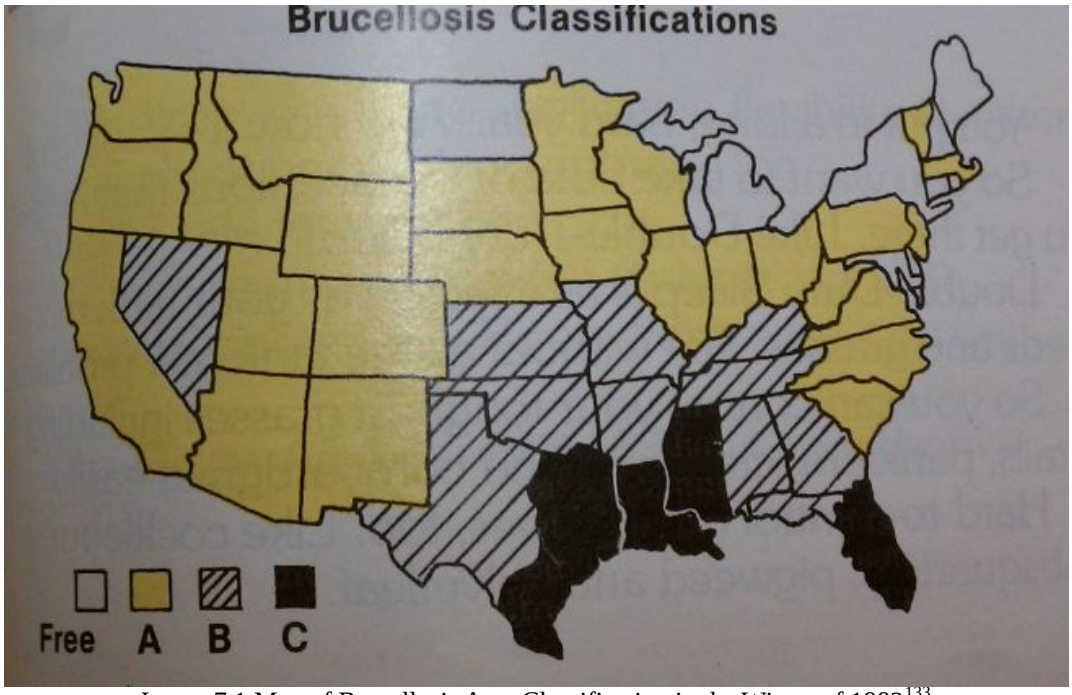

Image 7.1 Map of Brucellosis Area Classification in the Winter of 1982[133]

Of all the states that had been certified-free under the old eradication program, only nine states qualified as Free areas due to either a small number of persistent infected herds or reinfection in the last year in Class A states. Most of the Southern states that constituted the areas with the highest prevalence of the disease in the mid-1970s achieved Class B status due to the new state-federal program.[134] The four areas identified to receive the most federal funding in the eradication program, East Texas, Louisiana, Mississippi, and South Florida, all had the highest rate of infection and Class C status. By focusing money on these areas, the Department of Agriculture hoped to control the high rate of

132"Federal Brucellosis Eradication Funds Distributed Unevenly," 1341.
133"New State Bang's Classes Are Now in Effect," 1439.
134"Eradication Progress in Southern States," *Hoard's Dairyman* 128, no. 20 (1983): 1306.

infection and then eventually achieve eradication.

In addition to the new classification system and the regulations associated with moving cattle based on an areas designation, the changes to the UMR and the Code of Federal Regulations went into effect at the beginning of 1983. With these new changes, states had to alter their state programs to comply with the new UMR and the federal code. This posed a problem in Texas where the legal battle between R.L. Nunley and the Texas Animal Health Commission threatened the state brucellosis eradication program and the cattle economy of the state. In 1980, when the state modified its brucellosis eradication program to comply with the changes made to the UMR due to the technical commission report, the TAHC tried enforcing the new regulations on all herds across the state. Some Texas cattle owners sued to get injunctions as Nunley had in 1979, but they all failed and had to submit their cattle for testing.[135] In order to circumvent the permanent injunction granted to Nunley and assure that all cattle in the state fell under the purview of the brucellosis eradication program, the TAHC attempted to place economic pressure on Nunley by threatening potential cattle buyers about the consequences of buying cattle outside of the regulatory process. In 1981, the district court found the state animal health agency in contempt of the injunction preventing them from applying brucellosis regulations to his cattle and expanded the original injunction to prevent the state or its agents from applying any past, present, or future bovine brucellosis laws to the cattle and from harassing and intimidating people who bought Nunley's livestock.[136] Nunley remained exempt from the brucellosis eradication program due to the earlier injunction and the district judge removed the threat of negative economic incentive.

In response to this loophole in the Texas program, APHIS recommended that the entire state

135Texas Secretary of State, "Texas Animal Health Commission: Quarterly Report of the Texas Bovine Brucellosis Program," *Texas Register* 6, no. 62 (1981): 3035, http://texashistory.unt.edu/ark:/67531/metapth244753 (accessed February 24, 2013).

136*Texas Animal Health Commission v. R. J. Nunley*, 647 Southwestern 2nd, 951 (Supreme Court of Texas,1983), 952-953, http://scholar.google.com/scholar_case?q=nunley+AND+Texas+AND+Brucellosis&hl=en&as_sdt=2,44&case=10065852963999642134&scilh=0 (accessed March 06, 2013).

receive Class C status rather than allowing the state to divide the East and West portions so that at least some of the cattle owners in the state faced fewer regulations when moving cattle.[137] In an effort to protect Texas cattle owners from any federal restrictions that may have resulted from the Nunley case, an organization called the Pan American Livestock Exposition sued both the TAHC and R.L. Nunley hoping to enjoin the state to enforce brucellosis rules against every cattle owner in the state. In 1982, the trial judge declared the rules and regulations unconstitutional and unenforceable in the case of cattle owned by Nunley.[138] Texas managed to avoid being fully classified as a C state and instead received the expected split of the eastern and western portions of the state just as it had under the previous brucellosis eradication program.[139] APHIS officials expressed pleasure with the progress of the program in late 1982 and that the TAHC decided to appeal the contempt order. The commission and state cattle owners knew that if the appeal was denied then the only remaining actions would be to create legislation that somehow bypassed the ruling. If the courts or the legislature failed to fix the problem of Nunley and his cattle, Texas faced the threat of a USDA sanctioned quarantine as it had in the mid-1970s.[140] Concerned about the impact of a quarantine, many cattle owners in the state hoped that the bill proposed to bring the state brucellosis program in compliance with the new UMR also dealt with the legal problem of R.J. Nunley.

In March 1983, the Supreme Court of Texas ruled that the TAHC was in contempt of the original injunction issued to Nunley in 1979, but they struck down the language in the contempt verdict that granted him relief against all past, present, and future brucellosis regulations.[141] This meant that a court would have to weigh the merits of new brucellosis regulations and that the arguments upholding

137"Brucellosis Major Developments in 1982," 42.
138Texas Secretary of State, "Texas Animal Health Commission: Fourth Quarter and Annual Report for the Texas Bovine Brucellosis Program for the Period Ending August 31, 1982," *Texas Register* 7, no. 89 (1982), 4191, http://texashistory.unt.edu/ark:/67531/metapth244852 (accessed February 24, 2013).
139"Federal Regulations Revised for Brucellosis," *The Cattleman* 69, no. 9 (1983): 22.
140"TAHC Appeal Brucellosis Ruling," 21.
"Seeligson Studies Brucellosis Ruling," *The Cattleman* 69, no. 2 (1982): 54.
141*Texas Animal Health Commission v. R. J. Nunley*, 952-953.

the initial injunction may not withstand new legislation.[142] The Texas legislature, which regularly met only in odd years for 140 days, began working on proposed changes to the state brucellosis program in early 1983. These modifications brought the state law in concert with the Uniform Method and Rules and expanded the authority of the Texas Animal Health Commission in order to circumvent the 1979 brucellosis decision. The bill passed the House, but lobbying by former governor Dolph Briscoe, business partner of R.J Nunley, stalled the bill in the state senate at the end of the session.[143] In response, the Department of Agriculture threatened to quarantine all breeding cattle to prevent them from leaving the state and transmitting brucellosis. This prohibition on moving breeding cattle interstate affected only about 25% of the more than two million cattle moved out of Texas every year and the USDA estimated that it would cost the state anywhere from $80 million to $130 million in lost revenue.[144] The Department of Agriculture stated that it would also cut off all federal funding for the brucellosis eradication effort which had totaled $8 million in the previous year.[145] Officials from the department felt they had to impose the restrictions in order to protect brucellosis-free herds in all the other states and the integrity of the program even though it broke with the Reagan administration's philosophy that the program served as a subsidy and needed to be shrunk on the federal level.[146] Department employees noted that no outbreak of the disease existed at the time, but without a

142"Texas Cattleman Told Bangs Control Needed," *The Victoria Advocate* (Victoria, TX), April 19, 1983, http://news.google.com/newspapers?nid=861&dat=19830419&id=4yJIAAAAIBAJ&sjid=-4AMAAAAIBAJ&pg=4861,4128493 (accessed March 10, 2013).

143Wayne King, "U.S. Is Considering a Quarantine on Texas Cattle," *New York Times*, May 26, 1983.
Birnbaum.

144The vast majority of cattle transported out of Texas were steer, castrated bulls. The total sale of cattle and calves in 1982 equaled about $4.7 billion so the interstate selling of breeding cattle only represented a small portion of entire cattle sale industry for the state, but it disproportionally affected purebred breeders and people involved in livestock shows.
Birnbaum.
"Seeligson Studies Brucellosis Ruling," 54.
United States Bureau of the Census, *1982 Census of Agriculture* (Washington, D.C.: United States Government Printing Office, 1983), 13, http://usda.mannlib.cornell.edu/usda/AgCensusImages/1982/01/43/121/Table-23.pdf (accessed March 10, 2013).

145"Texas Cattle Are Quarantined," *Gainesville Sun* (Gainesville, FL), May 25, 1983, http://news.google.com/newspapers?nid=1320&dat=19830525&id=eD1WAAAAIBAJ&sjid=1-kDAAAAIBAJ&pg=4750,3110372 (accessed March 10, 2013).

146Birnbaum.

uniformly enforceable eradication program USDA officials worried that an outbreak would occur.[147] Given the delayed nature of brucellosis incubation, one diseased breed animal shipped to another state could reignite brucellosis across the country. The quarantine and the end of federal funding gave Texas a financial incentive to pass the brucellosis bill. The impending quarantine starting on June 1, 1983 would essentially eliminate Texas from the state-federal brucellosis eradication program and cut off its breeding cattle industry.

Texas cattle owners quickly responded to the call for an emergency quarantine through legal action. The president of the Texas and Southwestern Cattle Raisers Association and Houston cattlemen sued to prevent the quarantine from going into effect.[148] The TSCRA argued that brucellosis posed no immediate emergency threat to the health of the nation's cattle population, that it placed undue financial hardship on cattle owners, and that the USDA had not followed proper channels in establishing a quarantine.[149] These cattle owners fought the Department of Agriculture based on the epidemiological status of brucellosis, the financial burden, and the procedural front. The day before the start of the quarantine, a federal district judge rejected the emergency quarantine due to the economic harm it would place on the Texas cattle industry, but allowed the process of instating a non-emergency quarantine to continue. In addition to the impending federal quarantine, sixteen states had quarantines or pending quarantines against Texas cattle.[150] R.J. Nunley and Dolph Briscoe argued that Texans should take care of the problem on their own, without money from the federal government and that the quarantine represented an attempt by the federal government to interfere with the state legislative

147Ibid.,

148Garth Jones, "Judge Stops Texas Cattle Quarantine, *Spokane Chronicle* (Spokane, WA), June 1, 1983, http://news.google.com/newspapers?nid=1345&dat=19830601&id=3sQSAAAAIBAJ&sjid=cPkDAAAAIBAJ&pg=6972,399226 (accessed March 10, 2013).
"TSCRA Petitions Legislators to Pass Brucellosis Bill," *The Cattleman* 70, no. 2 (1983): 21.

149"TSCRA Petitions Legislators to Pass Brucellosis Bill," 22.

150"Around the Nation: Judge in Texas Blocks Brucellosis Quarantine," *New York Times*, June 1, 1983.
"Agriculture Agency Drops Texas Cattle Quarantine Intentions," *Wall Street Journal*, June 16, 1983.
"TSCRA Petitions Legislators to Pass Brucellosis Bill," 22.

process, but most Texas cattle owners wanted to avoid the pending quarantines by the federal government and other states.[151] The economic incentive of participation and the general acceptance of the eradication program after the publication of the NBTC study ensured that most Texas cattle owners thought that fighting against brucellosis eradication was a wasted effort and instead wanted to shape the program to their benefit. The president of the TSCRA reminded his members that "we don't have enough clout, numbers, or strength to be divided on issues that confront us. From now on, I hope that on any problem that face us we will present a united front."[152] With a decreasing number of farmers and ranchers in the United States, the members of agricultural organizations had to be united in order to wield their political power to influence policy that affected their livelihood including brucellosis eradication policy.[153] Instead of fighting the regulations of the state-federal brucellosis program itself, most Texas cattle owners focused on getting their legislators to pass a bill acceptable to them and the Department of Agriculture. They accepted the brucellosis eradication program as necessary to ensure Texas cattle could move freely across the country and the world.

With no regularly scheduled legislative sessions until 1985, Texas governor Mark White called a special session of the legislature during June 1983 in order to avoid any quarantines of the state's cattle. The TSCRA lobbied senators to ensure passage of the bill and a few changes had been made to address some of the concerns raised by state senators while still bringing the state regulations in line with federal regulations and making the state brucellosis eradication program constitutional.[154] The new program fulfilled the demands of the USDA, most Texas cattle owners, and eliminated the legal basis of Nunley's injunction against the TAHC. As a result, the Department of Agriculture removed its

151Birnbaum.
"Seeligson Studies Brucellosis Ruling," 22.
152"Seeligson Studies Brucellosis Ruling," 22.
153United States Bureau of the Census, 1, http://usda.mannlib.cornell.edu/usda/AgCensusImages/1982/01/51/121/Table-01.pdf (accessed March 10, 2013).
154"TSCRA Petitions Legislators to Pass Brucellosis Bill," 20.
"Texas to Vote on Bill to End Federal Threat of Cattle Quarantine," *Wall Street Journal*, June 24, 1983.
"Around the Nation: Texas Adopts a Law to Avoid Cattle Boycott," *New York Times*, June 29, 1983.

quarantine request and asked all states and foreign governments with restrictions against Texas cattle to lift them.[155] Texas cattle owners hoped that this marked the end of the debate over the brucellosis eradication policy. Many beef cattle owners saw the brucellosis eradication as less than ideal, but that the new program represented the best solution.[156] Every state had accepted the new state-federal brucellosis eradication program by mid-1983 and the framework for the accelerated eradication process had been set.

While the regulatory foundation of the program had been established, the question of funding remained open and in 1984, the Department of Agriculture tried to shift the responsibility of funding the program to the cattle industry through the check-off system. The USDA proposed that cattle owners pay a set amount per head of cattle sent to slaughter or amount of milk sent to market and that money would fund the program.[157] This program faced opposition from cattle owners who did not want to cover the entire cost of eradication program. The National Cattlemen Association "oppose[d] the idea of cattlemen paying in this way for a program designed to protect the public from undulant fever," as did numerous industry groups.[158] The argument that brucellosis eradication in cattle was needed to eradicate the disease in humans meant that cattle owners could fight against the concept that the federal program existed as a subsidy for cattle owners. Instead of eliminating a handout to the cattle industry, most cattle owners saw the check-off system as a tax on cattle owners, who only made up about .5% to

155United States Department of Agriculture Office of Information, "News Release June 28, 1983: USDA Cancels Proposal to Quarantine Texas Cattle for Brucellosis," 1. Andrews (Michael A.) Papers, Box 94-228/21, Folder – Brucellosis Quarantine, Dolph Briscoe Center for American History, University of Texas at Austin.

156"Seeligson Studies Brucellosis Ruling," 22.

157United States Department of Agriculture, "Analysis of Program Options for Producer Checkoff System Brucellosis Program, Congressional Briefing Paper February 7, 1984," 1, Texas and Southwestern Cattle Raisers Association Records, Box 2010-128/10, Folder – NCA – Miscellaneous – 1984, Dolph Briscoe Center for American History, University of Texas at Austin.

158"NCA Washington Report for April 1984," 3, Texas and Southwestern Cattle Raisers Association Records, Box 2010-128/10, Folder – NCA – Miscellaneous – 1984, Dolph Briscoe Center for American History, University of Texas at Austin.

Beef Business Bulletin 7, no. 30 (1984), 1, Texas and Southwestern Cattle Raisers Association Records, Box 2010-128/10, Folder – NCA – Miscellaneous – 1984, Dolph Briscoe Center for American History, University of Texas at Austin.

1.5% of the population, to protect the health of the whole country. Cattle owners argued that the brucellosis eradication program protected public health and not just the economic interest of those with cattle. While some cattle owners wanted the industry to pay more for parts of the program like vaccination and testing when change of ownership occurred, the industry rejected user fees and the check-off system.[159] The House Appropriation Committee criticized the USDA for the proposed user fees and instead it approved a $4 million increase in funding for the program in fiscal year 1985.[160] The Senate approved about $63 million and the two settled around that number in the final bill.[161] The administration succeeded in cutting federal funding for the 1983 budget, but Congress, cattle owners, and state animal health officials fought off any more cuts or shifts in financial responsibility. The state-federal eradication program remained state and federally funded with support for the program and funding by industry.

The State-Federal Brucellosis Eradication Cooperative Program 1983 – 2000

The USDA continued to work with cattle owners, state animal health officials, veterinarians, and researchers to make changes to the program and funding in order to make the program more efficient, easier for cattle owners to participate, to account for new testing methods and vaccines, and to target infected herds as the program continued in the 1980s and 1990s.[162] The brucellosis eradication

159National Cattlemen's Association Animal Health and Identification Committee, "1989 Annual Convention – Austin, TX, March 19-22, 1, Texas and Southwestern Cattle Raisers Association Records, Box 2010-128/2, Dolph Briscoe Center for American History, University of Texas at Austin.

160Bill Gallagher to National Cattlemen's Association Animal Health and Identification Committee, September 19, 1984, Texas and Southwestern Cattle Raisers Association Records, Box 2010-128/10, Folder – NCA – Miscellaneous – 1984, Dolph Briscoe Center for American History, University of Texas at Austin.
"Brucellosis User Fee Not Expected This Year," *The Cattleman* 70, no. 12 (1984): 22.

161"Washington Wire," *Beef Business Bulletin* 7, no. 48 (1984): 1, Texas and Southwestern Cattle Raisers Association Records, Box 2010-128/10, Folder – NCA – Miscellaneous – 1984, Dolph Briscoe Center for American History, University of Texas at Austin.

162United States Department of Agriculture Office of Information, 1.
National Cattlemen's Association, "Directives 1984," 1, Texas and Southwestern Cattle Raisers Association Records, Box 2010-128/10, Folder – NCA – Miscellaneous – 1984, Dolph Briscoe Center for American History, University of Texas at Austin.

program remained a state-federal-industry cooperative as it had been since the start of the program.[163] One of the areas of interest for improving the program for many cattle owners, state agencies, veterinarians, and scientists was research on brucellosis. These groups demanded more research and more funding for this work to meet the desire for better vaccines, tests, and understanding of brucellosis.[164] Science still served as the foundation of the program for most participants and they trusted that research would provide them with the most cost efficient method of eradication. In the early 1980s, state agricultural stations, the USDA, and universities began experimenting with new testing techniques such as enzyme-linked immunosorbent assay, heat inactive ring test, and other serological tests that provided for supplemental testing after identification by card test.[165] They also worked on a better vaccine and in 1996 the USDA approved the use of a new live vaccine, strain RB51.[166] This new vaccine had about the same efficiency of strain 19 vaccine but fewer side effects including false positives. The strain produced no antibody response to most standard brucellosis

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"TSCRA Comments on Federal Brucellosis Regulations," *The Cattleman* 70, no. 10 (1984): 22.
"Livestock Conservation Institute Adopts Brucellosis Resolutions," *Hoard's Dairyman* 130, no. 17 (1985): 965.
"Brucellosis Program Closes in on Eradication," *Hoard's Dairyman* 130, no. 18 (1985): 1022.
"B&C Area Vaccination Proposed by USDA," *Hoard's Dairyman* 130, no. 19 (1985): 1147.
""S" Branding Required After October," *Hoard's Dairyman* 133, no. 13 (1988): 639.

163United States Department of Agriculture Office of Information, 1.
John B. Armstrong, "Eradication of Bruce11osis at the Herd Population Level: Part 1. A Producer's Perspective," in *Advances in Brucellosis Research*, ed. L. Garry Adams (College Station, TX: Texas A&M University Press, 1990), 397.

164*Beef Business Bulletin* 7, no. 32 (1984): 1-2, Texas and Southwestern Cattle Raisers Association Records, Box 2010-128/10, Folder – NCA – Miscellaneous – 1984, Dolph Briscoe Center for American History, University of Texas at Austin.
The Cattleman 71, no. 3 (1984): 145.
Texas Animal Health Commission, *Fourth Quarter and Annual Report on Texas Bovine Brucellosis Program Fiscal Year 1984* (Austin: Texas Animal Health Commission, 1984), 2.

165Texas Animal Health Commission, *Fourth Quarter and Annual Report on Texas Bovine Brucellosis Program Fiscal Year 1982* (Austin: Texas Animal Health Commission, 1982), 2.
Texas Animal Health Commission, *Quarterly Report on Texas Bovine Brucellosis Program February 28, 1987 (2nd quarter)* (Austin: Texas Animal Health Commission, 1987), 13.
"Lab Note," *Animal Health Matters: A Report of the Texas Animal Health Commission Relating to Animal Health Matters* January – March (1992), 7.

166L. Garry Adams, "Development of Live Brucellosis Vaccines," in *Advances in Brucellosis Research*, ed. L. Garry Adams (College Station, TX: Texas A&M University Press, 1990), 250-276.
"Brucella abortus Strain RB51 Vaccine Licensed for Use in Cattle," Animal and Plant Health Inspection Service, http://www.aphis.usda.gov/animal_health/animal_dis_spec/cattle/downloads/rb51_vaccine.pdf (accessed March 10, 2013).
Gerhardt G. Schurig, Nammalwar Sriranganathan, and Michael J. Corbel "Brucellosis Vaccines: Past, Present, and Future," *Veterinary Microbiology* 90 (2000): 479-496.

detection tests, which reduced the risk of false positive reactors, but produced antibodies for specialized assays that could be used to detect if an animal had been vaccinated.[167] The RB51 vaccine effectively solved the problem of vaccinated animals reacting to serological testing and overcondemnation of cattle as reactors. Researchers also continued using computer modeling to determine the most effective method of eradication and impact brucellosis related policy.[168] In addition to focusing on techniques and research that could be directly applied to the eradication effort, scientists in the 1980s and 1990s researched the biology and pathogenicity of the *Brucella* organism and its relationship with its hosts on a cellular level.[169] This information contributed to the development of better vaccines, tests, and therapies at the end of the twentieth century. The concept of scientific agriculture developed by the Department of Agriculture, its network of researchers, and state agricultural agencies in the nineteenth century still shaped agricultural policy in the late twentieth century as government agencies and cattle owners relied on scientific research to make procedural and policy decisions in the brucellosis eradication program.

As the new state-federal brucellosis eradication program began in full during 1983, bovine brucellosis infection in the United States reached an all-time low. Only 0.41% of cattle reacted in the market cattle identification program and most of those infected herds were in East Texas, Louisiana, Mississippi, and South Florida, though even those states saw improvement. Florida, the state with the highest infection rate, experienced a decrease in the infection rate from 2.79% in 1978 to 1.42% in

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167"Brucella abortus Strain RB51 Vaccine Licensed for Use in Cattle".

168Brucellosis Program Closes in on Eradication," 1022.
Armstrong, 357.
Stephen H. Amosson, and Raymond A. Dietrich, "Regulatory Program Decisions Making Through Brucellosis Epidemiological and Econometric Simulation Modeling," in *Advances in Brucellosis Research*, ed. L. Garry Adams (College Station, TX: Texas A&M University Press, 1990), 338-356.
Texas Animal Health Commission, *Fourth Quarter and Annual Report on Texas Bovine Brucellosis Program Fiscal Year 1985* (Austin: Texas Animal Health Commission, 1985), 17.

169Edgardo Moreno, Axel Cloeckaert, and Ignacio Moriyón, "*Brucella* Evolution and Taxonomy," *Veterinary Microbiology* 90 (2002): 209-227.
"There May Be Help for Cow's Immune System," *Hoard's Dairyman* 131, no. 19 (1986): 866.

1982 and a corresponding 6% increase in the calf crop.[170] The changes to the eradication program made after the NBTC report had already decreased brucellosis infection rates as the classification program became active and all states conformed to the Uniform Method and Rules and the Code of Federal Regulations. During the mid-1980s, more states gained Free status as the program progressed, though the Department of Agriculture still reported over 6,000 herds in quarantine with brucellosis mainly still in the four areas of the South that had been identified in the NBTC study.[171] In order to reduce the number of infected cattle, many states, cattle owners, and veterinarians focused on increasing the rate of vaccination. A number of states like California already had laws requiring eligible dairy calves to receive vaccination with reduced dose strain 19 and some started requiring beef cattle rules to be consistent with the dairy cattle regulations.[172] These laws usually had exceptions for cattle moving directly to slaughter or quarantine feedlots and for non-breeding cattle, so that funding and effort could be focused on the female calves most likely to spread the disease.[173] States hoped that these vaccine regulations would reduce the rate of infection and move their states from Class A to Free status.[174] States with higher rates of infection also used vaccination to reduce the number of brucellosis cases. In the mid-1980s, Texas also adopted mandatory vaccination for breeding heifers less than 12 months old but only in the Class C area of the state in an effort to control the high rate of infection.[175] In fiscal year 1986, over a million eligible calves in Texas received vaccinations with 98% of them distributed for free through federal and state veterinarians and private veterinarians paid by the state. In addition, another 20,000 adult cattle in 297 highly infected herds received vaccination as part of the adult

170"Eradication Progress in Southern States," 1306.
171"Bang's Still Heaviest in Southeast Texas," *Hoard's Dairyman* 129, no. 11 (1984): 773.
172"California Law Stresses Bang's Vaccination," *Hoard's Dairyman* 129, no. 3 (1984): 147.
173"Must Bang's Vaccinate to Move Cattle," *Hoard's Dairyman* 129, no. 9 (1984): 609.
174"Require Vaccinates," *Hoard's Dairyman* 130, no. 8 (1985): 487.
175Texas Animal Health Commission, "News Release: Vaccine Proposal, September 4, 1984," 1, Texas and Southwestern Cattle Raisers Associations Records, Box 2010-128/6, Dolph Briscoe Center for American History, University of Texas at Austin.

vaccine program.[176] By covering the cost of vaccination and allowing private veterinarians who already worked with local herds to deliver the vaccine, the state tried to encourage compliance. Free vaccinations provided by a local veterinarian were cost effective and convenient for producers. The Department of Agriculture also adopted mandatory vaccination into the Code of Federal Regulations to prevent the interstate spread of brucellosis and to reduce the rate of infection. The new rule that went into effect in October 1986 called for the vaccination of any female calves moving in or out of Class B and Class C states unless moving to slaughter or quarantine feedlots.[177] By the end of 1986, only nine states in the South fell under the Class B or Class C status, and mandatory vaccination became a tool for prevention and for the goal of eradicating brucellosis.[178] The Department of Agriculture and state animal health officials continued to use testing, slaughter, and quarantine to detect the disease and prevent its spread, but through increased vaccination they hoped to reduce the number of cattle needing to be slaughtered or quarantined.

The USDA and state animal health committees also produced and shared more educational material in the early and mid-1980s in order to gain support for the program and educate producers about brucellosis. The lack of knowledge by producers and private veterinarians had been one of the problem areas identified in the NBTC study and government agencies along with trade journals addressed the issue. The USDA and state agencies used their outreach network of extension service agents to distribute pamphlets and booklets to cattle owners.[179] With titles like "Everything, (Well

176Texas Animal Health Commission, *Fourth Quarter and Annual Report on Texas Bovine Brucellosis Program Fiscal Year 1986* (Austin: Texas Animal Health Commission, 1986), 11.

177"B&C Area Vaccination Proposed by USDA," 1147.
"Only Vaccinates Can Move in Bang's High Risk Areas," *Hoard's Dairyman* 131, no. 22 (1986): 1026.

178Ibid., 1026.

179United States Department of Agriculture, Animal Health and Plant Inspection Service, Veterinary Service, *Cattle Owners: You Can Be Losing Money Because of Brucellosis* (Washington, D.C.: United States Department of Agriculture, Animal and Plant Health Inspection Service, Veterinary Services, 1981).
"Free Bang's Pamphlet," *Hoard's Dairyman* 126, no. 7 (1981): 533.
"The Hows and Why of Brucellosis," *The Cattleman* 69, no. 4 (1982): 106-124.
Clark Bolt, "Brucellosis and You," *The Cattleman* 70, no. 6 (1983): 24-27.

Almost Everything), You've Ever Wanted to Know About Brucellosis (Bang's)", "Brucellosis, the Disease", and "Cattle Owners You Could Be Losing Money Because of Brucellosis", these pamphlets and booklets were designed to inform herd owners about the disease, its impact on the economics of their herds, and how to prevent it from occurring.[180] Just as the USDA used education to inform producers about the disease and the eradication program at the beginning of the state-federal eradication cooperative program, the department and state agencies hoped that by educating producers it would encourage them to participate in the program and eradicate brucellosis in their herds. Along with information about the disease, the agencies also supplied education material like posters and slide-tape presentations that presented information about the eradication program.[181] In addition, they created radio and television reports on brucellosis and the success of the program to be broadcast on local stations. They also distributed this material to agricultural teachers and high schools in farming and ranching areas so that information on the disease and the eradication program reached future farmers.[182] The Department of Agriculture and state agencies also provided articles and information to trade journals for them to publish. A 1985 study of cattle owners in Southeastern Oklahoma and Southwestern Arkansas, a high prevalence area, found that a majority of them cited farm magazines as their most frequent source of information.[183] Farm journals had the potential to reach producers who might not get information from the extension service or other media. Along with provided material, these journals also published their own articles on brucellosis including quizzes designed to test the knowledge of cattle owners, updated information on the UMR, and information on brucellosis research

180Texas Animal Health Commission, *Fourth Quarter and Annual Report on Texas Bovine Brucellosis Program Fiscal Year 1982*, 18.
181Texas Animal Health Commission, *Fourth Quarter and Annual Report on Texas Bovine Brucellosis Program Fiscal Year 1984*, 18.
182Texas Animal Health Commission, *Fourth Quarter and Annual Report on Texas Bovine Brucellosis Program Fiscal Year 1982*, 18.
183Donald E. Voth, Richard Bernsten, and Julie Omohundro, *Technical Overview: Socioeconomic Issues in Brucellosis Eradication* (Fayetteville, AR: University of Arkansas at Fayetteville, 1985): 25.

and new knowledge about brucellosis and how to eradicate it.[184] Through its informational network including extension services and school programs and through media such as television, radio, and trade publications, the Department of Agriculture and state animal health agencies provided information about brucellosis and the eradication program to producers and made their case for participation in the eradication program.

In the late 1980s, the state-federal brucellosis eradication cooperative underwent modification due to the success of the program.

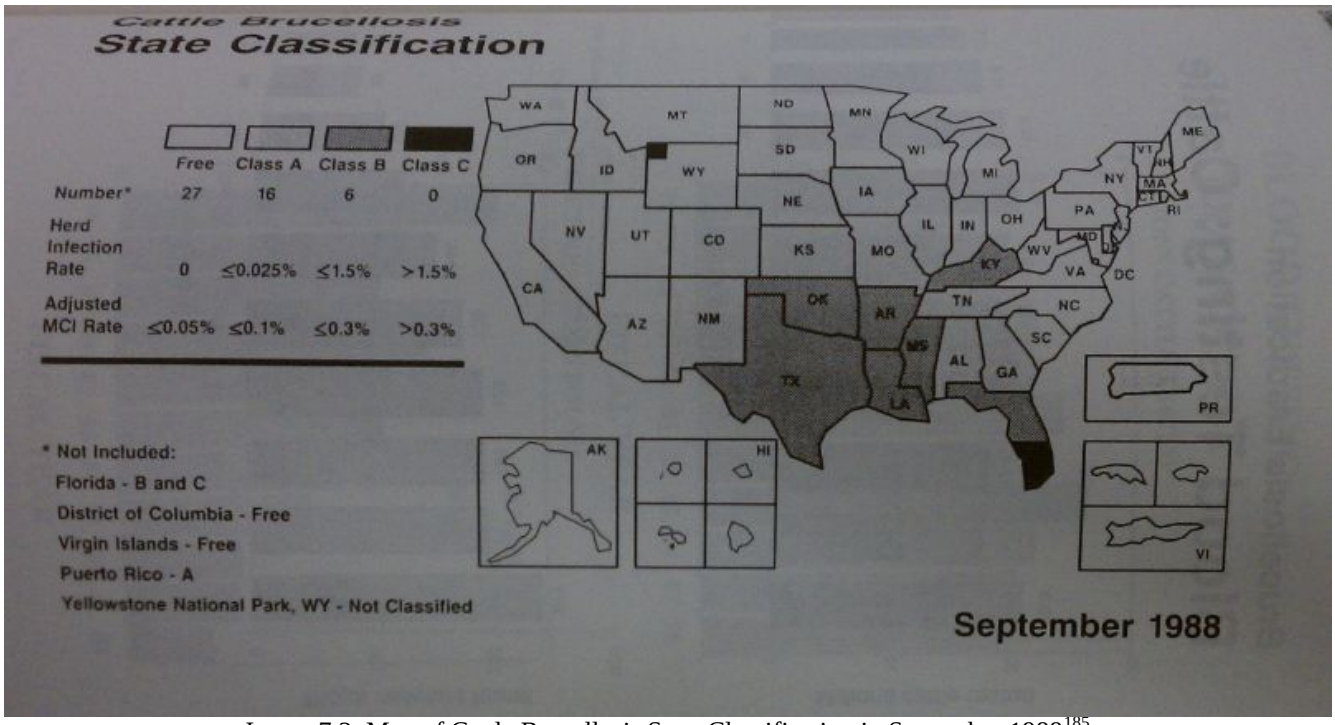

Image 7.2: Map of Cattle Brucellosis State Classification in September 1988[185]

With most states either Free or Class A, the program focused on eradication in the handful of states with Class B and Class C status. This included phasing out indemnity payments for slaughtering reactors. Indemnity had been a cornerstone of brucellosis eradication dating back to the initial federal funding of culled diseased cattle through the Agricultural Adjustment Act and had been one of the programs identified by the National Brucellosis Technical Commission as needed for industry

184"Brucellosis Infection: How to Avoid It," *Hoard's Dairyman* 125, no. 19 (1980): 1294.
"Two Tests Requirements for Brucellosis Explained," *The Cattleman* 71, no. 6 (1984): 22, 30.
185Armstrong, 389.

cooperation. The monetary incentive encouraged cattle owners to slaughter their cattle that tested as exposed to brucellosis. In the mid-1980s, the USDA began limiting indemnity funding to prevent cattle owners from slaughtering reactors and pocketing indemnity money as a method of brucellosis control. Herd owners who wanted indemnity had to develop a herd plan and work with their own veterinarian and state and federal animal health officials to try and eradicate the disease or had to be totally depopulating their herds.[186] In 1988, the department announced its plans to phase out indemnity from the eradication program. In the last few years, the restrictions on moving reactor cattle became the reason most cattle owners slaughtered their cattle rather than the promise of indemnity. Federal animal health officials planned to end federal indemnity entirely by October 1989 except for reactors in cases of complete herd depopulation.[187] States could still offer indemnity if they desired but by eliminating federal indemnity in most cases, APHIS could use those funds for other parts of the brucellosis eradication program.

Changes to the Uniform Method and Rules and state brucellosis laws occurred in the late 1980s designed to encourage states to speed their eradication effort and to prevent the spread of brucellosis. In October 1988, the Department of Agriculture expanded the use of S branding on cattle moving interstate. All heifer calves from infected herds in class B areas required either S brands or to be spayed regardless of their destination. In class C areas, by this time only the southern part of Florida, no cattle except spayed heifers and steers and S branded cattle for slaughter or quarantined feedlots could be moved at all.[188] These harsh tactics not only prevented the movement of cattle from higher prevalence areas and infected herds, but also created an economic incentive to eradicate brucellosis in these areas and herds. Not all new regulations led to restrictions on cattle movements. Some states added another branding mechanism, F branding, for heifers born to infected cattle or raised in infected herds.

186"Tighter Indemnity Rules," *Hoard's Dairyman* 131, no. 9 (1986): 493.
187"USDA to Phase Out Bang's Indemnity," *Hoard's Dairyman* 133, no. 12 (1988): 608.
188""S" Branding Required After October," 639.

Research showed that these heifers often tested negative for brucellosis exposure until they were close to calving. Herd owners presumed these animals to be brucellosis-free, but their latent infections exposed the rest of the herd to brucellosis when they aborted or calved.[189] States with F branding required heifers from Class B and Class C states to be branded to identify them as possible exposed cattle and to prevent them from being used as breeding stock.[190] This branding allowed these heifers to be transported across state lines for slaughter but prevented them from being sold as replacement cattle or breeding animals, allowing for the free movement of cattle while still reducing the risk of brucellosis infection. Through branding regulations, animal health officials and cattle owners balanced the need to move cattle and the need to reduce the rate of brucellosis infection.

In 1989, Florida reduced the rate of brucellosis enough to move from a split Class B/C state to being fully Class B. It became one of only six states in this category. Twenty-seven states achieved Free status and the other seventeen had Class A status. 1,411 herds across the country faced quarantines in fiscal year 1989, and 90% of all infections occurred in only 8 states.[191] Due to the success of the eradication program, the USDA reevaluated the state-federal cooperative and enacted the Rapid Completion Plan in 1989. By identifying and emphasizing the critical components of the program and implementing tougher restrictions on areas with brucellosis infection, the department aimed to achieve at least Class A ranking for all states by October 1990 and full eradication of brucellosis from the domestic cattle population in 1998.[192] The start of this new phase of the brucellosis eradication

189"Some States Require "F" Brand," *Hoard's Dairyman* 134, no. 4 (1989): 136.
190Ibid., 136.
""S" Branding Required After October," 639.
191"Brucellosis-Infected Herds at an All-Time Low," *Hoard's Dairyman* 135, no. 2 (1990): 64.
192"USDA 1990 Bruce11osis Restrictions Could Split State," *Animal Health Matters: A Report of the Texas Animal Health Commission Relating to Animal Health Matters* June/July (1989): 1.
House Committee on Appropriations, *Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations for 1998 Hearings Before a Subcommittee on Agriculture, Rural Development, Food and Drug Administration, and Related Agencies*, 105th Cong., 1st Sess., March 11, 1997, http://www.gpo.gov/fdsys/pkg/CHRG-105hhrg40551/html/CHRG-105hhrg40551.htm (accessed February 26, 2013).
United States Department of Agriculture, Animal and Plant Health Inspection Service, Veterinary Service, "A Concept Paper for a New Direction for the Bovine Bruce11osis Program," 2,

program concerned members of the Texas Animal Health Commission due to the high rate of infection in the East and Gulf Coast region of the state. While the rest of the state would most likely meet Class A standards, these counties would not and as a result, be effectively quarantined due to the new S brand regulations.[193] The increased restrictions on cattle movement created a quarantine situation and a financial burden on cattle owners with infected or untested herds in these counties as intended by the Department of Agriculture. They wanted the financial interest of cattle owners to push them into the eradication program and to move states to focus on eradicating the disease in pockets of high prevalence.

In order to understand why some counties had an increased prevalence of brucellosis and how they could improve the program, the TAHC conducted a survey of veterinarians in Texas. They found that 69% of new brucellosis incidences traced back to cattle sold privately by their owners.[194] These cattle did not fall under the mandatory first point of concentration testing since they did not enter livestock markets or auction houses. Instead, owners in the same area sold or traded cattle directly to each other, ignoring the required testing restrictions. The informal cattle trading network created an opportunity for brucellosis to spread and remain prevalent in East Texas counties. In addition, infected cattle entered the market through unscrupulous owners who concealed the herd of origin for cattle or who moved their herds to avoid testing.[195] The TAHC tried to address the remaining prevalence of brucellosis by alerting cattle owners to the problems associated with these practices. State veterinarians and UDSA veterinarians working in the state urged cattle owners, marketers, and animal health officials to find these sources of infection. Animal health officials called on the professional pride of

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http://www.aphis.usda.gov/newsroom/content/2009/10/printable/brucellosis_concept_paper.pdf (accessed February 26, 2013).

193"USDA 1990 Bruce11osis Restrictions Could Split State," 1.

194"Producers Still 'Buy' Brucellosis Infection, Says TAHC Veterinarians," *Animal Health Matters: A Report of the Texas Animal Health Commission Relating to Animal Health Matters*, February/March (1990): 5.

195"More Work Ahead for Texas' Brucellosis Program," *Animal Health Matters: A Report of the Texas Animal Health Commission Relating to Animal Health Matters*, August/September/October (1990): 3.

herd owners to encourage them to eradicate brucellosis in their herds and place pressure on their neighbors to do the same.[196] The state-federal cooperative eradication program generated economic reasons to eliminate brucellosis in herds, but some cattle owners avoided monitoring and therefore quarantines. Regulators hoped that peer and industry pressure would help drive these herd owners into the eradication program.

Texas and four of the six Class B states, Oklahoma, Florida, Louisiana, and Mississippi, failed to meet the October 1990 goal of Class A status, but the Department of Agriculture delayed imposing harsher restrictions due to the progress made by all of the states.[197] The department did not want to alienate or risk the cooperative effort of the states and cattle owners as they lowered prevalence rates and progressed towards Class A status. Based on the progress of the program in each state, Texas, Oklahoma, Florida, and Mississippi projected achieving Class A status in 1991 and Louisiana planned to gain it in the following year.[198] Most cattle owners, animal health officials, and veterinarians optimistically believed that the goal of brucellosis eradication was in sight. In order to speed the process and to target chronically infected herds in the state, the Texas Animal and Health Commission adopted regulations to depopulate small herds and supply state and federal indemnity money. These herds were less likely to be tested because the market cattle testing program sampled a portion of cattle at markets and auction houses, not all animals. If a herd owner had fewer cattle, the odds of having a cattle picked as a sample animal for testing decreased. By offering depopulation and indemnity, cattle not likely to be tested were entered into the program and their reactor cattle slaughtered or spayed.[199] The TAHC hoped the economic incentive of indemnity and the ability to replace infected cattle appealed to cattle owners unlikely to participate in the eradication program.

196Ibid., 3.

197"Texas Beats October Deadline! USDA Says Good Progress Made Against Brucellosis," *Animal Health Matters: A Report of the Texas Animal Health Commission Relating to Animal Health Matters*, November/December (1990): 1.

198Ibid., 2.

199"Depopulation Now an Option," *Animal Health Matters: A Report of the Texas Animal Health Commission Relating to Animal Health Matters*, November/December (1990): 6.

Nationally the rate of bovine brucellosis infection continued to drop in the early 1990s.[200] Animal health officials kept pressure on the cattle industry to eliminate the disease entirely, fearing that relaxing the program would lead to an increase in prevalence as happened in the 1970s. In Texas, the state began area and adjacent herd testing during 1989 in counties with active brucellosis infection, reoccurring brucellosis infection, or in areas where the rate of infection remained the same over the last few years.[201] This program targeted problem counties and aimed to find herd infections that may have otherwise been missed. In almost half of infected herds, only one animal tested as a reactor. These animals would have been almost impossible to find in market testing due to the sampling method used. Area and adjacent testing identified these sources of infection before they could spread *B. abortus* to other animals. The TAHC hoped that this testing program would help reduce the statewide rate of infection enough to achieve Class A status. The director of the agency argued that "we have enough experience with area testing to know it is not particularly cost-effective . . . but it is effective in finding the last infected herds, which otherwise could take years to find."[202] The state paid private veterinarians to test every eligible head of cattle in a county as part of the area testing program, but animal health officials thought that this program and its goal of finding infected herds and animals constituted a worthwhile expense in the fight to eradicate brucellosis. The program reached the last of the infected cattle that all other methods of testing, regulations, and financial incentive programs missed.

By mid-1992, all states except for Texas had achieved Class A or Free status and the USDA began relaxing some regulations for Class A states including removing the need for entry permits for

200"Infected Herd Count Drops in Texas, Nationally," *Animal Health Matters: A Report of the Texas Animal Health Commission Relating to Animal Health Matters*, November/December (1991): 1.
201Ibid., 1.
Ibid., 3.
202Ibid., 6.

interstate cattle travel.[203] As the rate of bovine brucellosis decreased in the 1980s and early 1990s, medical researchers and epidemiologists noticed a corresponding drop in the human incidence of brucellosis and a shift in the epidemiological pattern of the disease. Since Alice Evans connected Bang's bacillus and undulant fever, health professionals studying the disease in the United States found that the majority of cases occurred in men exposed to the bacteria through their work environment. This included slaughterhouse workers, cattle owners, dairy farm employees, veterinarians, and researchers who worked with bacteria. The Center for Disease Control studies of the disease in the 1970s indicated that this trend held true during that time as well (as discussed in the previous chapter). Once the new state-federal cooperative eradication program began, the number of cases of human brucellosis dropped to about 100 reported cases per year. Researchers suspected that the disease went unreported in most cases, but of those that did get reported to state health authorities a new pattern of infection emerged in the 1980s and early 1990s.[204] While in previous years the majority of cases occurred in men, the number of infections split more evenly between men and women and the majority of them occurred in Hispanics who likely acquired *B. melitensis* from raw goat milk and cheese in Mexico.[205] Cases of occupational infection and infection from other sources like dogs still occurred, but foodborne cases surpassed them.[206] As the rate of bovine and swine brucellosis dropped due to the

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203"Area Testing Continues," *Animal Health Matters: A Report of the Texas Animal Health Commission Relating to Animal Health Matters*, April – July (1992): 2.

204Valerie E. Ragan, "The Animal and Plant Health Inspection Service (APHIS) Brucellosis Eradication Program in the United States" *Veterinary Microbiology* 90, no. 1 (2002): 11-18.
Edward J. Young, "An Overview of Human Brucellosis," *Clinical Infectious Diseases* 21, no. 2 (1995): 283-289.
Jeffrey P. Taylor, and James N. Perdue, "The Changing Epidemiology of Human Brucellosis in Texas, 1977-1986," *American Journal of Epidemiology* 130, no. 1 (1989): 160-165.
Bruno B. Chomel et al., "Changing Trends In The Epidemiology Of Human Brucellosis In California From 1973 To 1992: A Shift Toward Foodborne Transmission," *Journal of Infectious Diseases* 170, no. 5 (1994): 1216-1223.

205Taylor, and Perdue, 161-165.
Chomel et al., 1217-1220.
"Epidemiologic Notes and Reports Brucellosis – Texas," *Morbidity and Mortality Weekly Report* 32, no. 42 (1983): 548-553, http://www.cdc.gov/mmwr/preview/mmwrhtml/00000163.htm (accessed March 5, 2013).

206Ragan, 16-17.
Taylor, and Perdue, 164.
Chomel et al., 1221-1222.

eradication program and awareness of how to prevent occupational cases increased due to education, human brucellosis transitioned from an occupational disease to a foodborne illness. The original perception of undulant fever as an exotic disease caused by exposure to raw goat milk returned at the end of the century as epidemiologists linked human cases of brucellosis to consumption of goat dairy products in other countries.

The prevalence of brucellosis in cattle continued to drop in the mid-1990s and in 1994 Texas achieved Class A status shared with 17 other states while 32 states had Free status.[207]

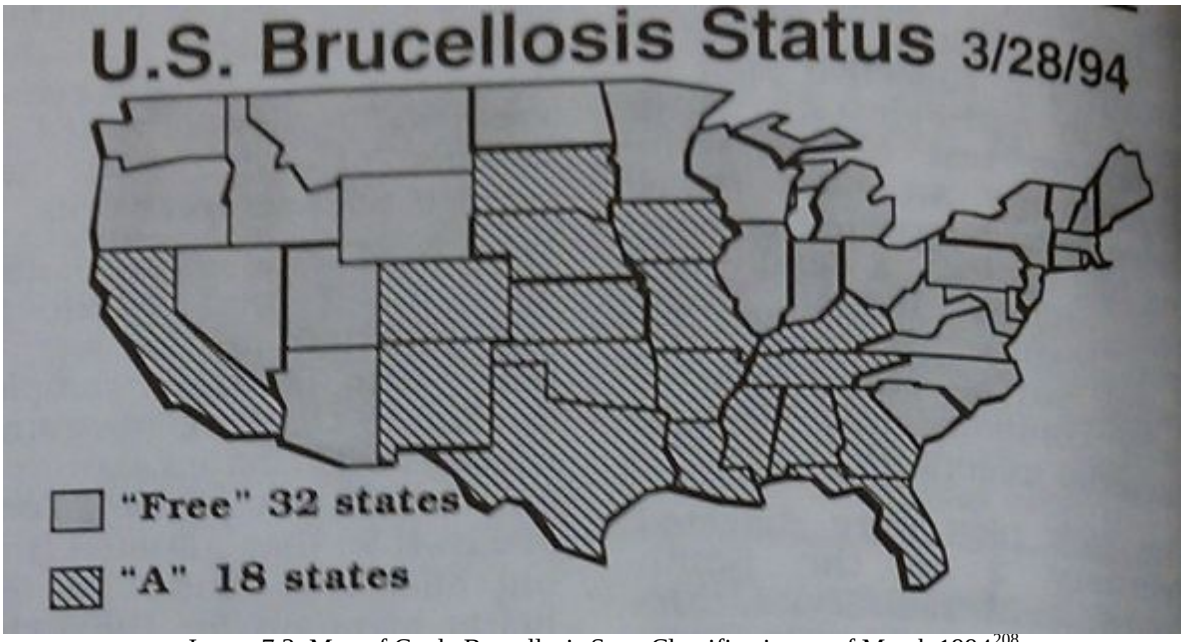

Image 7.3: Map of Cattle Brucellosis State Classification as of March 1994[208]

With the exception of California, the Class A areas clustered in the South and Plains states. For the most part, these states had also been the last ones to qualify as modified certified under the old brucellosis eradication program and had higher prevalence of the disease to start the new program. Some like California, South Dakota, New Mexico, Colorado, and Iowa came into the new classification program with Class A status and had not managed to eradicate the remaining cases of brucellosis or suffered from reinfection. The USDA still planned to have all states brucellosis-free by 1998 and the

207"Cattle Brucellosis: How the States Rate," *Animal Health Matters: A Report of the Texas Animal Health Commission Relating to Animal Health Matters*, Spring (1994): 4.
208Ibid., 4.

brucellosis eradication program continued on under the Rapid Completion Plan.[209] With all states either Free or Class A, the strictest brucellosis regulations for transporting cattle had disappeared, but testing, slaughter, and quarantines still served to detect, eliminate, or isolate infected herds or animals.

In Texas, animal health officials reminded cattle owners that by gaining Class A status they avoided harsh requirements and quarantines that could have devastated the interstate cattle economy.[210] These economic motivations continued to propel the state eradication program closer to its goal of Free status. Worried about the repercussions of not achieving this status by the 1998 deadline, the director of the Texas Animal Health Commission motivated his staff, private veterinarians, and cattle owners to "Cut the tail of the dragon!" by eliminating the last few cases of brucellosis in the state.[211] With only 90 herds in quarantine in the fall of 1994, Texas reached what he termed the "draggin' era . . . when a small number of infected herds drag on and on behind a sharp decline in infection."[212] He asked producers, veterinarians, and state and federal animal health officials to continue working together and using the same techniques that got the state to its low level of brucellosis infection including first point testing, area and adjacent testing, record keeping, testing before purchase, and determination by cattle owners and animal health professionals.[213] The current program seemed to be successful and hopes remained high that eradication would be achieved.

The continuation of the Rapid Completion Plan in Texas and around the country resulted in less than 100 quarantined herds in 1995.[214] By the following year, that number had been cut in half and in 1997, only 26 herds lived under quarantine with almost all of them in Texas and one each in Florida,

209House Committee on Appropriations.
210"Cattle Brucellosis: How the States Rate," 4.
211"Cut the Tail Off the Dragon!," *Animal Health Matters: A Report of the Texas Animal Health Commission Relating to Animal Health Matters*, Fall (1994): 1.
212Ibid., 1.
213Ibid., 2.
214Texas Animal Health Commission, "Brucellosis: A Texas Timeline," Texas Animal Health Commission, http://www.tahc.state.tx.us/animal_health/brucellosis/bovine_brucellosis_eradication_timeline.pdf (accessed October 17, 2012).

Kansas, Oklahoma, and South Dakota. The number of chronically infected herds under quarantine declined in the mid-1990s and so did the report of new herd infections from 202 in fiscal year 1995 to 141 in fiscal year 1996.[215] As the number of cattle brucellosis cases decreased, the USDA, state animal health officials, and cattle owners began investing more effort and money in controlling brucellosis in wild animals that served as reservoirs for *B. abortus*. Wild animals had already been suspected of infecting cattle in the 1970s, but the National Brucellosis Technical Commission dismissed the idea as unlikely. With few other sources of brucellosis, the bison population of Yellowstone National Park once again fell under suspicion of spreading brucellosis to domesticated cattle and bison in the region.[216] In 1996, the United States Animal Health Association urged state veterinarians to consider additional testing for cattle imported from Wyoming, Montana, and Idaho though few states created any regulations. In order to respond to this perceived threat, the USDA increased funding to support the eradication and research effort on wild bison in Yellowstone from $30,000 in fiscal year 1994 to $400,000 in fiscal year 1997.[217] The National Academy of Science also funded a study in 1997 to determine if bison or elk in the Yellowstone area spread brucellosis to domesticated cattle, how that occurred, if vaccination would be effective in this population, and how could the risk factors for transmission be reduced.[218] The study found a small risk of infection spreading between wild bison and elk and cattle though they expected an increased rate of contact between park herds and cattle as more bison left the park, increasing the risk of transmission. If brucellosis eradication could be achieved in cattle, bison, and elk, it would eliminate all reservoirs of *B. abortus*, but that seemed unlikely since no

215House Committee on Appropriations.
216United States Department of Agriculture, Animal and Plant Health Inspection Service, Veterinary Service, "A Concept Paper for a New Direction for the Bovine Bruce11osis Program," 5.
217House Committee on Appropriations.
218Norman F. Cheville, Dale R. McCullough, and Lee R. Paulson, *Brucellosis in the Greater Yellowstone Area* (Washington, D.C.: National Academy Press, 1998), 10-13, http://www.nap.edu/catalog.php?record_id=5957 (accessed March 02, 2013)

efficient method for vaccination existed.[219] Wild animals in the Yellowstone area presented a potential threat to the eradication effort so animal health officials and researchers began to address the problem in the late 1990s and continued working on a solution into the twenty-first century.

In order to eliminate the last few cases of bovine brucellosis, the Department of Agriculture once again reevaluated the state-federal brucellosis eradication program in 1997 and developed a new plan to achieve eradication. The Brucellosis Emergency Action Plan made brucellosis surveillance and case management priorities, treating each new case like an outbreak of an epizootic disease.[220] The plan continued to utilize the tools that made the Rapid Completion Plan successful including depopulation of infected herds, testing, herd management, and rapid response to reported reactors.[221] Brucellosis had already become an epizootic disease in the United States due to the way the eradicate effort developed in the twentieth century, but this marked the first time the USDA designated cases of the disease as requiring emergency action. The eradication effort continued successfully in the late 1990s with only nine Class A states at the end of 1997.[222] The state-federal eradication program missed the 1998 deadline for eradication, but the program continued to gain ground. At the end of December 2000, the country had no recorded cases of bovine brucellosis as Texas depopulated its last infected herd, but the status of bovine brucellosis eradication was short-lived.[223] Due to the long incubation period of the disease, animal health officials expected more cases to be detected in the future and in 2001, a handful of cases appeared. The program continued with emergency response and herd depopulation.[224] The United States briefly achieved eradication, but could not dismantle the state-federal brucellosis eradication cooperative program due to the long incubation period of disease, the method of serological

219Cheville, McCullough, and Paulson, 5-9.
220United States Department of Agriculture, Animal and Plant Health Inspection Service, Veterinary Service, "A Concept Paper for a New Direction for the Bovine Bruce11osis Program," 2.
221Ragan, 14.
222Texas Animal Health Commission, "Brucellosis: A Texas Timeline".
223Ibid.
Ragan, 16.
224Ragan, 16.

testing, the inefficiency of the vaccine, and the reservoir of *B. abortus* harbored by wildlife.[225] Instead, the program continued on into the twenty-first century, aimed at preventing outbreaks of bovine brucellosis and trying to eradicate the disease permanently in the United States.

Conclusion

In the late 1970s, cattle owners, animal health officials, and veterinarians involved in the Accelerated Brucellosis Eradication Program waited for the report of the National Brucellosis Technical Commission to determine the most cost-effective and scientific method of dealing with the disease. Both supporters and detractors of the eradication effort hoped that the commission's report would shape and guide the program based on scientific evidence. Just as it had during the rest of the twentieth century, the agricultural community relied on science and the concept of scientific agriculture to solve the problem of brucellosis. The technical commission utilized many different methods to arrive at its conclusions including surveys of all groups involved in the eradication program, analysis of factors that impacted the state-federal cooperative, and computer modeling. Published in 1978, the report not only affirmed the need for brucellosis eradication, but also proposed a number of changes to the program and its guidelines in order to achieve this goal. The suggested modifications restored the cooperative and flexible nature of the program that had been the cornerstone of the state-federal eradication effort in the 1950s and 1960s. Many dairy cattle owners and beef cattle owners who had been disappointed by the brucellosis eradication program in the mid-1970s, became cautiously optimistic that the proposed plan could succeed since it addressed many of the complaints that they, animal health officials, and veterinarians had raised. The cooperative effort still needed cattle owners' support to be successful and by adopting the NBTC's proposals for the state-federal program, the

225United States Department of Agriculture, Animal and Plant Health Inspection Service, Veterinary Service, “A Concept Paper for a New Direction for the Bovine Bruce11osis Program,” 1.

Department of Agriculture regained much of the industry approval for the program it had lost during the earlier part of the decade.

While the changes to the brucellosis program reignited interest in eradication effort, the cooperative needed more money to implement the proposed rules and regulations. Based on the computer modeling done by the technical commission, USDA officials argued that the amount of money spent on eradication over the next few years was much smaller than the cost of continuous brucellosis surveillance. Congress approved increased funding for the program over a three-year period and southern states with high prevalence of brucellosis agreed to contribute more towards their own state programs. The Animal and Plant Health Inspection Service gradually adopted new regulations for the national program from 1979 to 1981 as the eradication effort expanded and funding increased. Even states that had historically delayed or declined the program like Texas experienced increased participation resulting in a decrease in the percent of reactors detected through market testing. With the overhaul of the brucellosis program's procedures, renewed faith in the program, and increased funding to ensure that animal health officials could cover the cost of implementing the new regulations, eradication of brucellosis seemed possible in the late 1970s and early 1980s.

While the brucellosis program seemed to be on the way toward its goal of eradicating the disease, several political and legal factors complicated the state-federal cooperative effort in the early 1980s. Challenges to the program from Reagan administration officials and some opponents in the range cattle industry threatened to diminish or end the eradication program during 1982 and 1983. Both the Reagan administration's attempts to reduce the budget of the brucellosis eradication program and R.L. Nunley's legal battle with the Texas Animal Health Commission demonstrated the role of politics in the battle over brucellosis policy and regulations and its relationship with science and the concept of scientific agriculture. In 1982, officials from the Office of Management and Budget relied on the principle of small government to argue for shrinking the funding for the state-federal eradication

cooperative. They thought that the coordinated brucellosis eradication program overstepped the role of the federal and state governments and allowed the government to interfere with industry business practices while supplying the cattle owners with an unneeded subsidy. However, most government officials, politicians, and cattle owners from both the dairy industry and the beef industry disagreed with this assessment of the state-federal cooperative. Based on the report of the National Brucellosis Technical Commission and the belief in agricultural program rooted in science, most involved with the brucellosis eradication program during the early 1980s supported it. Many beef and range cattle owners no longer wanted to eliminate the cooperative and they no longer believed that it constituted an unfair subsidy like they had in the mid-twentieth century. The application of science to study the problem of brucellosis shifted the opinion of those who had rejected the program and undercut the subsidy-based political argument that existed from the start of federal funding for brucellosis eradication in the 1930s.

While more beef producers supported the eradication program in the early 1980s, some used science and politics to argue against proposed changes to the Uniform Method and Rules. During the previous decades of the eradication program, not only had many range cattle owners, their veterinarians, and animal health officials in predominantly range industry states made political arguments against the national brucellosis eradication effort, but they also used scientific arguments to justify their position on brucellosis control. The NBTC report settled many of the disagreements over the science of brucellosis and established the need for eradication instead of control, but it also created an opportunity for beef producers and politicians from states with a significant beef industry to utilize science to fight aspects of the program that they disliked. This included changes to the program that decreased flexibility in herd management and the use of the card test. Dissenters of the UMR changes argued that the technical committee study demonstrated the need for flexibility in herd plans and the unreliability of the card test. They thought that by adopting measures that decreased flexibility in the program and by utilizing card testing, APHIS abandoned the principles of scientific agriculture and the use of it as a

foundation for the brucellosis eradication program. Those who opposed program changes, mainly beef cattle producers, continued to use science to justify their opposition to the new rules and while they had shed political arguments about the necessity of federal funding for the brucellosis program, they tied together science and the conservative political climate to create new political rationales to avoid changes to brucellosis related regulations. Some beef cattle producers and the politicians who represented them argued that the new restriction in herd management under the brucellosis eradication program constrained industry and encroached on the freedom of farmers. Trading on the Jeffersonian and Jacksonian view of the relationship of farmers, liberty, and self-reliance and on the national shift towards conservative policy, the people who fought against the program changes argued that they were not only unscientific, but also that they violated political principles of industry independent and small government. While the use of science undermined the political argument over subsidies and the need for a brucellosis eradication program, it lent strength to a new political argument. Most cattle owners no longer used political rhetoric to fight against the state-federal cooperative's existence, but some still used both science and politics to argue against specific aspects of the program that they disliked.

Despite the OMB's proposal to defund brucellosis eradication in 1982 and opposition to new regulations, the state-federal program pushed forward the following year. Its budget for fiscal year 1983 had been reduced, but not slashed to the extent that officials from the administration wanted and the proposed new regulations for herd plans, card testing, and a new classification system went into effect at the start of the new year. However, a legal challenge by one Texas cattle owner threatened the entire state-federal program and the multibillion dollar cattle industry. R.L. Nunley, who had unsuccessfully sued over the brucellosis eradication effort in the late 1960s, used both scientific and political arguments in his lawsuit about the Texas brucellosis program regulations in the late 1970s. He maintained that the Texas brucellosis eradication program deprived owners of their property unnecessarily and relied on inaccurate testing (claims that numerous beef cattle owners made at the

time though many soon abandoned them based on the results of the National Brucellosis Technical Commission study and the changes to the state-federal eradication program). Nunley continued to fight against new Texas Animal Health Commission brucellosis regulations in the 1980s and the courts ordered that his cattle be excluded from any mandatory testing for the disease. This meant that not all the cattle in the state of Texas fell under the state-federal eradication program, creating a potential reservoir of *Brucella* infection.

When the USDA implemented new brucellosis classifications and transportation regulations in early 1983, Texas animal health officials hoped that the state legislature would pass new animal disease eradication policy that aligned the state program with the federal guidelines. However, due to the lobbying efforts of the Nunley's business partner, former governor Dolph Briscoe, the bill never passed. The result of the failure to conform state laws to federal policy demonstrated the impact of economics and politics on brucellosis eradication policy and the changing role of industry in the eradication program. In response to the failed legislation in Texas, the USDA threatened to quarantine breeding cattle from the state of Texas. As it did in 1965, the department exerted its power to quarantine and once again shifted the balance of the industry-state-federal cooperative towards the federal government. It also put the Reagan administration in the odd situation of defending the brucellosis eradication program a year after they effectively tried to end it by defunding it. The politics of small government and state control that dominated Republican policy in the early 1980s were superseded by the need for the federal government to enforce uniform policy and prevent the spread of a potentially epizootic disease. Lobbying and politics prevented the passage of new brucellosis regulations in Texas and the preservation of federal authority and the science of brucellosis eradication forced the Reagan administration to take action despite their attempts to terminate the state-federal eradication program.

Set to begin in the summer of 1983, the quarantine of breeding cattle not only prevented the spread of brucellosis from untested herds to disease-free herds, but it also provided economic incentive

to change state policy. Estimated to cost state producers $80 million to $130 million a year in lost revenue, the brucellosis quarantine would damage the cattle economy of Texas and the United States. Economics and cost-benefit had long played a role in *Brucella* control, dating back to the early attempts to end abortion storms in the mid-nineteenth century, and the potential economic repercussions of the quarantine drove Texas cattle owners and politicians to action. Some cattle owners like Nunley and Briscoe continued to argue against complying with the national program since they viewed the threat of quarantine as inhibiting industry and federal interference in a state program. However, most of the state's cattle owners wanted the legislature to pass a bill that updated Texas' brucellosis policy due to the economic threat of the proposed quarantine and the recognition that the relationship of the industry-state-federal cooperative had changed. The political influence of farmers and livestock owners shrunk as the number of producers decreased in the late twentieth century and most Texas cattle owners realized that the balance of power in the cooperative had shifted from industry towards the government. While the program officials still wanted industry support and owner cooperation, state and federal animal health officials increasingly used the necessity to eradicate brucellosis that had been highlighted in the National Brucellosis Technical Commission report to rationalize the use of police power and force cattle owners to comply with the eradication program. The NBTC study demonstrated the economic and health importance of *Brucella* eradication and program officials utilized this evidence to justify their actions even when some members of the cattle industry rejected them. The acceptance of the commission's findings and the decreased political power of cattle owners shifted the balance of power in the cooperative program from industry to the state. This made the brucellosis eradication effort similar to other epizootic disease eradication programs where Department of Agriculture animal disease control officials forced compliance by any means necessary.

In June 1983, the Texas legislature passed a bill altering its state brucellosis program to align with federal guidelines, avoiding a federal quarantine. This acceptance of the state-federal cooperative

in Texas marked the last major challenge to the eradication program from cattle owners in the late twentieth century. In the mid and late 1980s, officials at the Department of Agriculture continued tightening interstate transportation and branding rules to speed up the eradication effort. While the federal government had the power to make states and herd owners follow its regulations, the USDA continued to work with cattle owners, private veterinarians, and state animal health officials to make the program easier and more efficient. Along with implementing new regulations designed to prevent the spread of brucellosis, the department listened to the requests of many cattle owners and states when modifying the program. Federal officials approved program changes based on industry and state animal disease control agencies suggestions such as limited indemnity and F branding. The state-federal eradication program remained a cooperative effort though the power to determine participation and develop regulations had shifted from cattle owners to the Department of Agriculture. When developing new brucellosis policy, program officials also integrated new research and scientific discoveries about the epidemiology of brucellosis, the biology of *Brucella*, and the development of new vaccines and testing techniques into the program. This kept the program grounded in scientific agriculture and continued the tradition of utilizing science to address animal disease problems. In order to spread information about new research on brucellosis and the need to eradicate the disease, agencies in the agricultural research network created new promotional and informational material for cattle owners and private veterinarians. Animal disease control agents hoped that educating producers and their veterinarians would encourage cattle owners to enter the brucellosis eradication program, especially in high prevalence areas. As more cattle owners joined the state-federal cooperative in the 1980s and more states gained disease-free status, program officials hoped to achieve eradication by the end of the century. This period of the program resembled the start of the Accelerated Brucellosis Eradication program though the power of the cattle industry to control the eradication effort had diminished. In both the 1950s and the 1980s, the state-federal cooperative experienced general industry acceptance

with high participation, agencies and organizations created educational outreach material about the program, and most involved with brucellosis eradication believed that the program would succeed.

During the 1990s, state and federal animal health officials continued tightening interstate shipping regulations and mandated more testing to catch the last pockets of brucellosis infection. As the prevalence of the disease in domesticated cattle dropped to nearly zero, the focus of the eradication effort shifted to wild animals who served as a reservoir for *Brucella*. Until the end of the twentieth century, the brucellosis eradication program exclusively centered on livestock because they had economic value and the potential to spread the disease to humans through occupational contact or consumer goods. The fact that game animals also carried the bacteria played almost no role in brucellosis policy. Some range cattle owners became concerned about wild-to-domesticated spread in the 1970s, but researchers concluded that the risk of transmission from wild animals to domesticated cattle was negligible. The decreasing number of brucellosis cases among cattle in the mid-1990s renewed concerns about the spread of the disease between these two populations. With animals such as feral pigs, wild sheep, and elk acting as hosts for species of *Brucella,* domesticated cattle who interacted with wild animals in any region could contract the disease, but animal health officials paid particular attention to the relationship of wild bison herds and range cattle herds in the Greater Yellowstone area. Bison in the Yellowstone herd had a relatively high prevalence of brucellosis and increasingly came into contact with range cattle in Montana, Wyoming, and Idaho as the park's herd grew in the late twentieth century. Cattle owners and animal health officials worried that Yellowstone bison would infect disease-free cattle with *Brucella*, jeopardizing the national eradication effort. The interaction between wild and domesticated animals expanded the reach of the brucellosis eradication program and the traditional scope of federal animal disease control officials beyond livestock who had an economic value and role. The interest in Yellowstone bison also brought new stake-holders to the state-federal program including officials from the Department of the Interior, rangers with the National

Park Services, and environmental organizations. Just as they had in the past, those involved in the eradication effort turned to science to answer the problem of *Brucella abortus* in wild bison and worked together to address the concerns of all involved with the management of Yellowstone bison and cattle herds in the area. A new brucellosis cooperative formed, though this one focused on wild animals and how to eradicate the disease while still preserving the national park's bison population. The attempt to control brucellosis in Yellowstone herds blurred the line between Yellowstone area bison and cattle since the two populations contracted the same disease while at the same time it highlighted the divide between wild and domesticated animals based on their utility.

The brucellosis eradication effort continued in the late 1990s, and in December 2000, the Department of Agriculture declared the country free of bovine brucellosis. However, animal health officials expected more cases of the disease to be reported in the twenty-first century and continued monitoring cattle for *Brucella* exposure through milk and market channel testing. Program officials and cattle owners still worried about domesticated cattle catching brucellosis from wild bison and other cases of cross-species transmission. While the state-federal cooperative achieved its goal of eradicating brucellosis in livestock, the program could not be dismantled. Brucellosis still posed an epizootic threat to the American cattle population so the eradication program shifted to a surveillance program that continued on during the twenty-first century.

Epilogue

After nearly sixty years, the state-federal brucellosis eradication program met its goal of eliminating *Brucella* infection in domesticated cattle. While the last reactor to the disease was reported in 2012, the Department of Agriculture and state animal health agencies continue to monitor for it due to the possibility of the transmission from foreign cattle or one of the many mammals that act as host for species of the bacteria.[1] In its study on the eradication effort in the 1970s, the National Brucellosis Technical Commission (NBTC) concluded that eradicating brucellosis rather than controlling for it would save money because the USDA would be able to dismantle the brucellosis program if eradication occurred while a control program would require constant monitoring of cattle to prevent the spread of brucellosis from high to low prevalence areas.[2] However, due to the biological realities of brucellosis transmission, the monitoring aspect of the state-federal cooperative stayed in place, even after eradication. The necessity of brucellosis monitoring demonstrates the difficulties of ensuring that cattle remain free of the disease and one of the reasons why the state-federal eradication effort took so long to eliminate the bacteria among cattle. The bovine brucellosis effort in the twentieth century had been hampered by biological factors along with economic, political, and cultural forces. The difficulty of diagnosing, treating, and preventing an infection caused by an intracellular bacteria posed problems for researchers and animal health officials but so did working with cattle owners, private veterinarians, consumers, and politicians to devise an eradication program that appealed to all stake-holders.

As the NBTC noted in its report, each group involved in the state-federal cooperative lobbied to adjust rules and regulations to suit its industry business model or political viewpoints.[3] While officials at the Department of Agriculture, most of the agricultural sector, and animal health practitioners and

[1]Veterinary Services, "Brucellosis Affected Herd Report, July 1, 2013," Animal and Plant Health Inspection Service, United States Department of Agriculture, 3, www.aphis.usda.gov/animal_health/animal_diseases/brucellosis/downloads/monthly_rpt.pps (accessed July 22, 2013).
[2]National Brucellosis Technical Commission, *Report - National Brucellosis Technical Commission* (Washington, D.C.: Animal and Plant Health Inspection Service, United States Department of Agriculture, 1978), 1-1.
[3]Ibid., 4.7-1 – 4.7-8.

researchers believed in scientific agriculture and developing solutions to farming and livestock problems through science, the development of brucellosis related policy was impacted by more than the epidemiology of the disease and the biology of its causal organism. Eradication of *Brucella* in domesticated cattle took longer than expected not only because of the difficulty in conclusively testing for the bacteria, vaccinating against it, or treating infections, but also because cattle owners, veterinarians, and animal health officials in different industries and areas wanted regulations that complimented existing business practices, industry economics, political dynamics, and their interpretation of the science on brucellosis disease. These groups lobbied for their viewpoint through nongovernmental organizations like the National Brucellosis Committee and the United States Animal Health Association and also through political bodies. While the Department of Agriculture and state animal health agencies developed as scientific and animal health institutions, they were still part of the government and subject to the changing political climate. State legislatures had the power to approve and modify state brucellosis eradication policy while both state legislatures and Congress controlled funding for the cooperative effort. Being part of the government gave animal health agencies legitimacy and the ability to exercise policing power, but also subjected their policy to political influence and lobbying.

Cattle Industries and Their Impact on Brucellosis Policy

None of the stake-holders involved in debate over the development and course of the state-federal brucellosis cooperative had total consensus among the people who composed the group. Not all veterinarians, politicians, or animal health officials had the same viewpoints about the science and economics of eradication. Their thoughts on *Brucella* control often varied based on the type of cattle industry that they interacted with or represented. The industry division on brucellosis policy between dairy and range cattle owners was based on the differences in industry practices, the economics of each

field, and regional geography. The variations between these two parts of the cattle industry led to numerous debates about the science of *Brucella*, the impact of the disease, and the best course of action to manage it. The demands of dairy producers in the 1930s and 1940s to develop a state-federal eradication cooperative drove the Department of Agriculture to create a national brucellosis eradication effort in the early 1950s. Once the program started, dairy owners continued to push for total national eradication to reduce the risk of reinfection of disease-free herds. This part of the cattle industry viewed brucellosis as an economically dangerous cattle disease and demanded state and federal intervention to reduce the risk of financial harm. At the same time, range cattle owners and beef producers resisted the creation of a state-federal cooperative because they did not see the disease as harmful enough to warrant a government regulated eradication program. After the creation of the program, many range cattle producers advocated for less testing and restrictions on their cattle and objected to stringent measures that limited their ability to move animals. While not all dairy cattle owners supported *Brucella* eradication and a state-federal program and not all range cattle owners wanted less government involvement and regulations, the debate over policy and the state-federal cooperative usually divided into these two sides.

For the most part, dairy cattle owners wanted some kind of brucellosis eradication program since the disease seemed to affect them greatly. The close confines of dairy operations allowed the bacteria to spread with greater ease and the loss of calf stock and milk production negatively impacted dairy farmers. In the late nineteenth and early twentieth centuries, some of these cattle owners developed strategies to deal with contagious abortion and requested that the scientific agriculture network, including researchers at the Department of Agriculture and experiment stations, determine the cause of the disease and how to prevent it. The commodities disease known as contagious abortion had a negative economic impact on dairy herds, but many dairy cattle owners and animal health officials in the early twentieth century thought that the cost of eradicating the disease was still more than allowing

it to cycle through herds. Researchers in scientific agriculture institutions and cattle owners created ways to eradicate the disease and encouraged dairy cattle owners to utilize them but only if it was economically feasible.

The economic consequences of having *Brucella* infected cows increased for dairy producers in the 1930s as the public became aware of the connection between contagious abortion and undulant fever. Whether pasteurized or raw, milk that came from certified brucellosis-free herds became more valuable due to consumer demands. In addition, as states began regulating the importation of reactor or nontested cattle, the value of disease-free animals increased. In order to make their milk more desirable to consumers and their cattle easier to transport, many dairy cattle owners in the 1930s asked for state and federal funding to help underwrite the expense of testing cattle for exposure to the disease and the cost of selling, isolating, or slaughtering any reactors. Funding for test-and-slaughter came through New Deal politics rather than disease control policy and the funds were heavily utilized by dairy cattle owners mostly in the Midwest. Funding for strain 19 vaccinations, a method of control favored by some state animal health officials and many range cattle owners, started not long after the federal funding for culling, but no uniform federal program developed that regulated state policy and provided consistent funding for test-and-slaughter and vaccinations. Once World War II started, federal funding for any method of controlling or eradicating brucellosis in herds ended though both dairy and range cattle owners continued using both testing and the vaccine to eliminate the disease in their animals.

After World War II ended, the Department of Agriculture focused on brucellosis since it was estimated to be the most costly livestock disease at the time. State programs for control or eradication in the 1930s and the continued work of cattle owners during the war had reduced the prevalence of *Brucella* infection among cattle and humans. Eradication of the disease in cattle seemed possible and dairy cattle owners continued to campaign for an eradication program as they had in the 1930s. Many of these producers had eliminated the disease among their animals due to consumer demands and

wanted to ensure that their herds would remain brucellosis-free. They, along with many breeders, also wanted more uniform state and interstate shipping regulations. Different states had contradictory *Brucella* testing or vaccination requirements, complicating the ability of breeders to move their animals and dairy producers to receive replacement cattle. A state-federal cooperative like those created to eradicate bovine tuberculosis or tick fever would lead to uniform rules among states, federal funding, and a coordinated campaign to prevent the reemergence of brucellosis in disease-free herds and eradicate it nationally.

While dairy cattle owners advocated for a national brucellosis eradication program, range cattle owners wanted individual cattle owners to determine how they would handle the disease and demanded that any federal program that might develop allow for vaccination without testing. Many producers with range animals wanted limited brucellosis related regulations because they did not see the disease as an economic threat like dairy cattle owners did. With more space and more heads of cattle, not only was the disease less prevalent among range animals, but also the consequences of infection had less impact on the economics of a herd. In the late 1940s and early 1950s, range cattle owners feared the spread of foot-and-mouth disease from Mexico more than the presence of brucellosis in their herds. They wanted animal health officials to focus on the disease that posed the greatest threat to the economics of their segment of the cattle industry.

In addition to the economics of disease on the range, industry practices made eradication through traditional methods of test-and-slaughter difficult for cattle owners in range and semi-range areas. If a range cattle owner wanted to eliminate brucellosis, the logistics of rounding up cattle to frequently test them for *Brucella* exposure posed a problem. They would have to gather all of their animals, draw blood, send it for testing, and then regather their herds to pull any reactors. Then they would have to repeat this procedure every few months until the herd achieved certified-free status. This required extra effort for range cattle owners and their employees making test-and-slaughter too costly

for most range cattle owners. Instead, many range cattle owners preferred to control brucellosis in their herds using strain 19 vaccine. Vaccination offered a cost-effective alternative to test-and-slaughter. Calves could be vaccinated with strain 19 during regularly scheduled roundups reducing the burden on range cattle owners.

The difference in management preferences for *Brucella* infection created a divide between the dairy and range industry over brucellosis policy. Many dairy producers wanted testing to be a mandatory part of any brucellosis program, while range cattle owners demanded that they would only support a national program that had a vaccination without testing option and exceptions for testing range cattle for interstate transportation. Both groups lobbied for their position and in the late 1940s, the United States Livestock Sanitary Association created a compromise program that became the framework for the Accelerated Brucellosis Eradication Program. The 1954 state-federal cooperative allowed cattle owners to opt into the program and decided which of four plans they would utilize to eradicate the disease in their herds. These plans included both test-and-slaughter plans favored by dairy cattle owners and a vaccination without testing favored by range cattle owners. The Department of Agriculture hoped that, with industry support, brucellosis could be eradicated swiftly.

As the national brucellosis eradication program continued on into the 1960s, range cattle owners once again began raising objections to the program. As the state-federal cooperative effort progressed, most cattle owners, veterinarians, and animal health officials recognized that the disease could only be controlled through vaccination, not fully eradicated, and that animals from nonparticipating herds or vaccine only herds posed a threat to certified-free cattle. This led program officials to tighten restrictions on interstate shipping and increase testing for cattle moving between states. Changes to the beef cattle industry such as the rise of feedlots also led the USDA to modify brucellosis monitoring and testing procedures to prevent the disease from moving from high prevalence areas in the South to disease-free states. Animal health officials hoped that more stringent interstate

shipping rules, testing, and traceback policies would keep brucellosis from spreading and eventually eradicate it completely in domesticated cattle. Despite the attempts to reduce the risk of exposure to *Brucella*, the incidence of the disease increased in the early 1970s with the reinfection of disease-free herds in both beef and dairy producing states.

The reemergence of brucellosis in certified-free herds led both dairy and beef cattle owners to question the policy of the brucellosis eradication program and demand a review of the national program. While both groups wanted to overhaul policy, they still wanted different outcomes. Most dairy producers wanted eradication while beef producers favored control methods that limited reinfection of certified-free herds but did not actively try to eradicate the disease among infected animals. This debate over eradication versus control led beef herd owners to request a study on the Accelerated Brucellosis Eradication Program and the feasibility and cost-effectiveness of eradication. In the late 1970s, the National Brucellosis Technical Commission reviewed the program and evaluated many different plans for the state-federal cooperative. The technical commission determined that eradication proved to be the most cost-effective method to prevent the reemergence of brucellosis and they provided numerous suggestions on how to address the criticisms of the program raised by all different types of cattle owners. Though it favored eradication over control, most beef producers respected the results of the study and reengaged with the revamped state-federal cooperative in the late 1970s and early 1980s. Not only did the study respond to their critiques of the eradication effort, but it also utilized science to address the effectiveness of different brucellosis policy. Most of the agricultural community including those in the beef industry respected scientific agriculture and trusted science experts to create programs that benefited American agriculture. Science had been intertwined with agriculture since the nineteenth century in the United States. When range and beef cattle owners objected to brucellosis policy in the past, they often argued that state-federal policy was unscientific and rooted in politics or economics rather than actual knowledge about *Brucella* and the feasibility of eradicating the bacteria among cattle.

They wanted a brucellosis program derived from research and both dairy and range cattle owners believed that the technical commission study could provide the answer to how to deal with brucellosis. Most beef producers did not question the science of the NBTC and even agreed with many of the commission's conclusions about card testing and other policy issues. The balanced, scientific approach of the technical commission and the thoroughness of its report led even supporters of brucellosis control to accept its conclusions about the necessity of brucellosis eradication. The publication of the NBTC report and the overhaul of the state-federal based on its suggestions did not eliminate the differences between dairy and range cattle owners, but it did effectively end the debate over the need for a state-federal eradication program. Cattle owners from different segments of the American cattle industry continued to lobby for brucellosis policy that favored their industry in the 1980s and 1990s but within the framework of a national eradication program.

Reconceptualization of Brucella infection and Its Impact on Policy

Another factor that influenced the creation of the state-federal brucellosis eradication program and its development in the second-half of the twentieth century was the changing conceptualization of the disease caused by *Brucella* and its relationship with human health. The national effort to eradicate abortions began about sixty years ago, but herd owners and animal health practitioner in some areas of the United States tried for about 150 years to prevent clusters of abortions that seemed to appear every few years. In the mid-nineteenth century, researchers and cattle owners recognized that these abortion storms seemed to be of a contagious nature and speculated about the cause. The acceptance of germ theory and Bang's discovery of the causal bacteria for contagious abortion in the late nineteenth and early twentieth centuries allowed scientists and cattle owners to investigate the prevalence of the disease in cattle. By the 1920s, they determined that contagious abortion was not epizootic as assumed in the nineteenth century, but rather a cyclical enzootic infection of herds. At the same time, public

health researchers discovered that the bacteria that caused contagious abortion also caused undulant fever. This changed the conceptualization of contagious abortion and undulant fever. The two diseases caused by the same organism became one disease, brucellosis. The decision to start state programs and federal funding for brucellosis control in the 1930s arose from concerns about human health and the economics of having disease-free dairy products. In the 1940s and 1950s, both occupational and consumer health became rationales for the creation of a brucellosis eradication program. Eliminating the disease in cattle was the most effective public health measure for preventing the disease in humans. By linking contagious abortion and undulant fever biologically and epidemiologically, animal health and public health professionals intertwined animal and human health needs. Human health became part of the animal disease eradication effort and one of the reasons justifying a state-federal cooperative program.

The reconceptualization of contagious abortion and undulant fever as brucellosis impacted the creation of the eradication program and in turn, the effort to eliminate *Brucella* in domesticated cattle affected the epidemiology of the disease. State programs from the 1930s and 1940s had already reduced the prevalence of the disease and the percentage of reactor cattle continued to decrease when the Accelerated Brucellosis Eradication Program began in 1954. By 1961, nearly ¾ of the counties in the United States had achieved at least modified certified status and some states had already been designated certified-free.[4] In the early twentieth century, contagious abortion was considered an enzootic in cattle herds, but by the 1960s, the effort to control the disease had eradicated it in many herds and areas. Coupled with the reduction of funding for vaccinations in certified-free areas in the late 1960s, the elimination of brucellosis reactors in many herds left those herds without any immunity to the disease. As a result, if *Brucella* infection reemerged in those areas, it would be epizootic rather

[4]C. K. Mingle, "The Cooperative State-Federal Brucellosis Eradication Program: A Program Report," *National Brucellosis Committee: 1965 Proceedings* (Washington, D.C.: United States Department of Agriculture, 1965), 53.

than enzootic. The policy to eradicate brucellosis made the disease more economically devastating in disease-free herds than in herds with enzootic infection.[5] The shift of the disease from enzootic to epizootic and the resulting cost burden of the reemergence of brucellosis in certified-free areas in the 1970s drove complaints about the state-federal cooperative and raised questions about if eradicating brucellosis was the most cost-effective way of dealing with *Brucella* infection in cattle. The results of the National Brucellosis Technical Commission report affirmed the benefit of the eradication effort and claimed that herds with enzootic infection constituted a threat to the health of disease-free herds. In the 1980s and 1990s, the reinvigorated state-federal cooperative led to near eradication of brucellosis in American domesticated cattle. The elimination of *Brucella* in cattle herds made the disease epizootic and the USDA shifted its brucellosis policy to account for this change. In the late 1990s, any detected brucellosis reactor was treated as an emergency case and measures designed to prevent the spread of epizootics were put into place. The brucellosis eradication policy in the twentieth century transformed brucellosis from an enzootic disease to a potentially economically devastating epizootic disease in cattle.[6]

The shift of brucellosis from an enzootic to an epizootic and the increased cost-burden of infection associated with that change impacted the role of the state-federal brucellosis eradication effort

[5]Since no cattle in a certified-free herd had brucellosis, any case of a reactor would constitute an epizootic infection. The threat to herd health came from the lack of immunity that usually protected the stability of herds when contagious abortion was enzootic. Not only was it possible that all pregnant cows would abort their calves, resulting in no calf crop and significantly reduced milk production, but under brucellosis eradication program guidelines, cattle owners with reactors in modified certified and certified-free areas effectively had to depopulate their herds. Even with indemnity, the cattle owner faced significant financial loss if infection of a disease-free herd occurred.

[6]The transformation of brucellosis from an enzootic disease to an epizootic disease due to United States governmental policy was similar to what happened with foot-and-mouth disease in Great Britain as discussed by Abigail Woods in her manuscript, *A Manufactured Plague*. She points out that the British could have allowed foot-and-mouth disease to continue as an enzootic disease rather than eradicating it. If it had remained enzootic then the effect of the persistent disease might have been less severe and less costly than the subsequent epidemics and policy of slaughter used to repeatedly eradicate the disease. The same logic could be used for brucellosis as an argument against the eradication effort and for allowing the disease to continue as an enzootic infection. However unlike foot-and-mouth disease, human health played a role in decision to eradicate brucellosis in livestock and the decrease in *Brucella* infection in animals did lead to a decrease in human cases of the brucellosis.
Abigail Woods, *A Manufactured Plague: The History of Foot-and-Mouth Disease in Britain* (London: Earthscan, 2004).

after it achieved eradication. In the twenty-first century, the USDA continued monitoring cattle for brucellosis infection due to the repercussions of the reemergence of the disease and continued working with other government agencies and environmental groups to prevent the spread of *Brucella abortus* from wild animals with enzootic infection to susceptible cattle populations. The monitoring program faces the same potential problems and conflicts that the eradication program experienced in the twentieth century and is subject to the same factors that influenced and shaped brucellosis policy in the past. Animal health officials built current policy based on the biology and epidemiology of *Brucella*, the needs of those participating in the monitoring effort, and scientific and technological advances. They worked with different stake-holders in the program who wanted policy to be enacted based on economic realities, political climates, and cultural norms in order to create a program that prevented the spread of the bacteria and encouraged participation. Two program policy decisions in the early twenty-first century demonstrated how these factors shaped the brucellosis monitoring program that grew from the brucellosis eradication program.

Brucellosis in Yellowstone Bison in the Twenty-First Century

The first policy decision served as a continuation of disease policy that began in the late 1990s, controlling brucellosis in Yellowstone area bison. Officials from the Department of Agriculture, the Department of the Interior, the National Park Service, and the Forestry Service evaluated plans to monitor and control *Brucella* in the park's bison during the late 1990s and in 2000, they released a plan to control the spread of the bacteria while allowing bison to roam outside of the park.[7] The evaluation group investigated the impact of different bison brucellosis control programs not only on the size and freedom of the Yellowstone herd and on the cattle industry in the area, but also on the regional tourism and recreation economy and the Yellowstone area environment.[8] They also tried to balance the values

[7]Jim Robbins, "Anger Over Culling of Yellowstone Bison," *New York Times*, March 23, 2008.
[8]Interagency Bison Management Plan, *Final Environmental Impact Statement: Executive Summary*, 61-72, 75-79.

of local Native American populations who viewed bison as culturally and spiritually significant and animal rights activists who saw the animals as environmentally and historically important.[9] Just like the National Brucellosis Technical Commission, the committee researching different methods to control brucellosis in park bison tried to develop a cost-effective, scientifically sound program that accounted for different concerns raised by different stake-holders in the program.

When the State of Montana, the National Park Services, and the Animal and Health Inspection Service signed the Interagency Bison Management Plan, they formed a new interagency cooperative.[10] The control plan that they agreed upon hinged on flexibility based on herd size and serostatus of bison. It allowed bison to roam in designated range areas outside of the park in the winter and hazed back into the park in the spring. It also required the slaughter of seropositive bison, monitoring of pregnant females, vaccination of bison calves, vaccination and additional testing for cattle in shared range area, and gave program officials the ability to quarantine and cull bison that strayed repeatedly from the park or if the herd size grew over 3,000 heads.[11] The group studying the feasibility of bison brucellosis control predicted that the chosen brucellosis policy would have limited impact on the bison population, the disease status of cattle in Montana, and on the value of ranching.[12] They thought that actions like culling might anger animal rights groups or the general public, but expected minimal resistance to the

[9]Many cattle owners and animal health officials thought of Yellowstone bison as a reservoir for *Brucella* in cattle and that the only way to ensure eradication was to control the exposure to bison. This rationale had similarities to the argument for controlling brucellosis in livestock to protect human health.
Ibid., 74, 81.

[10]*Western Watersheds Project v. Ken Salazar*, 766 F. Supp.2d, 1095 (United States District Court, D. Montana, Missoula Division 2011), 1105, http://scholar.google.com/scholar_case?case=16710162239431116113&hl=en&as_sdt=2,44, (accessed July 25, 2013).

[11]Culling diseased cattle as a method of population control for the Yellowstone bison herd echoed the development of federal funding for brucellosis control in the 1930s. Funding for test-and-slaughter arose out of agricultural policy designed to reduce the number of cattle during the Great Depression and Dust Bowl. New Deal program officials in the 1930s and bison management program officials in the 2000s advocated that cattle owners kill diseased animals, accomplishing the goal of reducing disease burden and excess population.
Interagency Bison Management Plan, *Final Environmental Impact Statement: Executive Summary*, 21-23.

[12]Ibid., 51.

program based on social values.[13] The program started in December 2000 and in addition to managing brucellosis infection, the Interagency Bison Management Plan committed to conducting research on the use of RB51 vaccine and the feasibility of remote vaccination, the course of the disease in bison, and the persistence of the bacteria in the local environment.[14] Just as those involved with bovine brucellosis policy valued scientific agriculture and wanted to develop a program based on science, officials coordinating the Yellowstone bison program hoped to use science to reduce the risk of interspecies *Brucella abortus* transmission.

During the early and mid-2000s, the park bison population continued to grow and cattle owners became more concerned about the spread of brucellosis as more bison left the park for the public range area. As the population swelled over the target number of 3,000, the Interagency Bison Management Plan authorized the use of depopulation methods including authorized hunting that started in 2005 and slaughter in 2007.[15] As predicted in the feasibility study, these actions drew the ire of environmental and conservation groups.[16] Due to public protests over the proposed 2007 slaughter order, Montana Governor Brian Schweitzer ordered that the buffalo be returned to Yellowstone National Park instead and proposed regulation changes to the bison and cattle brucellosis programs. Animal health officials complied with the movement order but worried about any changes to the programs since animals from one herd in the state tested positive for *Brucella* exposure in 2007. As a result, the state faced a possible

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[13]Ibid., 51.
Interagency Bison Management Plan, *Final Environmental Impact Statement: Volume 1*, 335-337.

[14]Status Review Team, "A Status Review of Adaptive Management Elements, 2000 to 2005," Interagency Bison Management Plan, 14-27, http://ibmp.info/Library/7%20-%20IBMP%20Status%20Review_Sept2005.pdf (accessed July 25, 2013).

[15]Interagency Bison Management Plan, "Adaptive Management Adjustments in Western Boundary Area," http://ibmp.info/Library/8%20-%20Adaptive%20Management%20Memo_2005.pdf (accessed July 25, 2013).
Interagency Bison Management Plan Partner Agencies, Memorandum: Annual Report, July 1, 2008 through June 30, 2009, 25, http://ibmp.info/Library/IBMP%202008-2009%20Annual%20Report.pdf (accessed July 25, 2013).
Western Watersheds Project v. Ken Salazar, 1117.

[16]Jim Robbins, "Montana, Under Pressure, to Take Bison Back to Yellowstone," *New York Times*, June 2, 2007.
Robbins, "Anger Over Culling of Yellowstone Bison".
Western Watersheds Project v. Ken Salazar, 1116.

downgrade in its status as part of the state-federal brucellosis eradication cooperative.[17] The loss of Free status would result in more testing and more restrictions on the movement of cattle resulting in a negative impact on Montana's cattle economy. Despite public outrage, the policy of culling and hunting continued in an effort to prevent the spread of brucellosis.[18] In 2009, several conservation organizations, Native American groups, and Montana citizens sued the National Parks Services to end the Interagency Bison Management Plan population control measures including culling.[19] While the evaluation committee had tried to develop a bison brucellosis control program that balanced the concerns of cattle owners, animal rights groups, and Native American tribes, the implementation of slaughter as part of the management plan led to discontent among those who wanted to increase the buffalo population and opposed killing bison in the park herd. As during the late 1960s, anger over brucellosis policy and the science of *Brucella* led to legal challenges to the disease program. Like range cattle owners who disagreed with the rationales for mandatory brucellosis eradication in Florida and Texas in the mid-twentieth century, organizations that opposed the killing of bison to control brucellosis in cattle claimed that the disease did not constituent an epizootic threat. In a press release about the lawsuit, Stephany Seay, a spokesperson for the Buffalo Field Campaign claimed

> Brucellosis is a fraud being used by the cattle industry to maintain control over public lands grazing . . . this issue is not about brucellosis at all; it's a centuries-old range war being fought over who gets to eat the grass.[20]

In the opinion of those involved in filing the injunction against the government plan, the threat of *Brucella* infection served as a cover to reduce the Yellowstone bison herd size and the competition for public range resources. They did not see brucellosis as a significant disease risk but rather as a minor

[17]Robbins, "Montana, Under Pressure, to Take Bison Back to Yellowstone".
[18]Robbins, “Anger Over Culling of Yellowstone Bison”.
[19]Buffalo Field Campaign, “Press Release 11/09/09: Conservationists File Suit Against Federal Agencies To End Slaughter of Yellowstone Bison, Failed Management Endangering American Icon, Wasting Millions Annually,” http://www.buffalofieldcampaign.org/media/press0910/pressreleases0910/110909.html (accessed July 25, 2013).
[20]Ibid.

cattle illness that did not justify the use of culling.

In 2011, Montana Senior District Judge Charles C. Lovell ruled in favor of the National Parks Service and Interagency Bison Management Plan officials allowing the culling process to continue. During the hearing, scientific experts for the Park Service testified that Yellowstone bison served as a reservoir for *Brucella abortus* and that brucellosis posed a serious health threat to cattle that interacted with bison and humans. They also established that the biology of the bacteria made it difficult to develop vaccines, test for the disease, and treat infected animals and humans, making it important to prevent the spread of brucellosis. In addition, the defendants asserted that since the government had already eradicated the disease in cattle at great expense, to allow it to spread back into Montana cattle herds would cause economic harm to the state.[21] The defendants utilized scientific, health, and economic arguments to justify the slaughter of diseased bison as a method of population control. In his decision, the judge wrote that the court

> recognized that the State of Montana has the absolute right, under its police powers in protecting the health, safety and welfare of its inhabitants, to remove, by reasonable means, possibly infected trespassing Federal bison which migrate into Montana. The court examined the disease of brucellosis, found that, according to the expert testimony, the brucellosis parasite is a facultative intracellular parasite, which in English simply means that, number one, it is a parasite.[22]

The judge thought that scientific evidence proved brucellosis to be a harmful threat to the public health of Montanans and their cattle and that the State of Montana had the right to cull any brucellosis-exposed bison that migrated out of Yellowstone Park.[23] The court relied on scientific authority to justify

[21]*Western Watersheds Project v. Ken Salazar*, 116-117.
[22]Ibid., 1099.
[23]The plaintiffs had also offered their own expert testimony that the judge viewed as “a previously unknown and allegedly "expert" study.” He believed that the defendants provided more accurate scientific arguments as evidenced in his

the use of the state's police powers and rejected the plaintiffs' arguments that the bison brucellosis culling program constituted an abuse of government authority. Like the court decisions in Florida and Texas in the mid-twentieth century, the legal system relied on expert testimony and science to arrive at its decision that affirmed the use of policing power and the methods of the brucellosis program.

Animal Identification and Disease Management in the Twenty-First Century

The Interagency Bison Management Plan was not the only program designed to prevent the reemergence of brucellosis in cattle in the twenty-first century. The National Brucellosis Surveillance Plan utilized the same diagnostic tests and strategies as the brucellosis eradication program to monitor cattle for reactors.[24] Just like the state-federal eradication effort, the surveillance program relied on identifying reactors, determining what cattle they interacted with in market channels, and tracing them back to their herd of origin to prevent the spread of brucellosis. Program officials had to be able to identify cattle in order to follow their path to market. They saw identification and the ability to track animal movements as vital to

> ensure a rapid response when animal disease events take place. An efficient and accurate animal disease traceability system helps reduce the number of animals involved in an investigation, reduces the time needed to respond, and decreases the cost to producers and the government.[25]

Under the brucellosis eradication program of the twentieth century, cattle owners used eartags, backtags, tattoos, and brands to identify cattle, their vaccination status, and their reactor status and

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decision.
Ibid., 1116.

[24]Department of Agriculture Animal and Health Plant Inspection Service Veterinary Services, "National Bovine Brucellosis Surveillance Plan," 14-16, http://www.aphis.usda.gov/animal_health/animal_diseases/brucellosis/downloads/nat_bruc_surv_plan.pdf (accessed July 25, 2013).

[25]Department of Agriculture Animal and Health Plant Inspection Service Veterinary Services, "Animal Disease Traceability Home," http://www.aphis.usda.gov/traceability/ (accessed July 25, 2013).

program epidemiologists used paper records to determine where the animals had been and what other cattle they may have come in contact with. In 2006, Bush administration officials in the Department of Agriculture implemented the National Animal Identification System to modernize the identification and traceability system for brucellosis and other diseases including diseases in animals other than cattle.[26] The voluntary system asked farmers to register their animals in a national database and relied on electronic eartags to precisely identify an animal and its health status. The computer chipped tags also recorded the movement of animals and allowed animal health officials to swiftly determine where a reactor animal had been and what other animals it interacted with, reducing the length of time it took to identify exposed livestock.[27] Microchip eartags fulfilled the Department of Agriculture's desire to quickly and cost-effectively prevent the spread of livestock diseases.

USDA officials hoped livestock owners would sign up for the voluntary program but participation rates never grew. Cattle owners who rejected the program had numerous rationales for objecting to the surveillance plan, just as cattle owners who protested aspects of the state-federal brucellosis cooperative in the twentieth century did. Some producers worried about the added expense of microchip tags that cost more than other identification methods.[28] Others had concerns that once the government began tracking large livestock, it would start requiring people to tag all animals including pets and that tracking would expand further. Libertarian politicians and organizations thought that tracing the movement of animals violated privacy rights and could lead to the government utilizing public health and disease monitoring to justify tracking people.[29] Other cattle owners disliked the lack

[26]Department of Agriculture Animal and Health Plant Inspection Service Veterinary Services, "Questions and Answers: Animal Disease Traceability Final Rule," 1, http://www.aphis.usda.gov/traceability/downloads/rule_movement_general.pdf (accessed July, 2013).
[27]Erik Eckholm, "Rebellion on the Range Over a Cattle ID Plan," *New York Times*, June 27, 2009.
[28]Ibid.
Department of Agriculture Animal and Health Plant Inspection Service Veterinary Services, "Questions and Answers: Animal Disease Traceability Final Rule," 5.
[29]Eckholm.
Department of Agriculture Animal and Health Plant Inspection Service Veterinary Services, "Questions and Answers:

of flexibility in the microchip tag system since it excluded all other forms of identification, including traditional methods like branding that provided more permanent means of identifying cattle. Cattle rustlers (a problem in range cattle areas) could remove eartags but branding supplied a more lasting way of verifying legal possession of livestock.[30] Producers who had economic fears, political concerns, and dealt with industry realities did not join the voluntary National Animal Identification System due to these apprehensions.

Due to low enrollment, the animal identification system was never fully implemented and the Obama administration Department of Agriculture officials discontinued the program.[31] However, they did not give up on creating a national system of identifying livestock for the purpose of disease control. In August 2011, the USDA proposed amending the Federal Register to "establishing minimum national official identification and documentation requirements for the traceability of livestock moving interstate."[32] Unlike the previous surveillance system, the new program would be mandatory for animals shipped interstate since it was a change to the federal code. The regulations would require metal or radio frequency eartags and veterinarian inspections for certain livestock such as cattle, horses, swine, and sheep as a means of identification and to improve traceability.[33] The changes to the Federal Registrar program tied the identification of animals to their health. The brucellosis eradication program already used the vaccinate status and reactor status of an animal as its identity and a passport for interstate transportation. Brucellosis monitoring continued that strategy to prevent the reemergence of the disease in cattle and the proposed changes to the federal rules expanded this concept to more types of livestock.

Animal Disease Traceability Final Rule," 6.

[30]Dan Barry, "Texas Still Has Its Rustlers, and Men in White Hats Chasing Them," *New York Times*, June 5, 2011. Kate Galbraith, "Some Cattle Ranchers Worry About Proposed Ear-Tag Rules," *New York Times*, January 25, 2012.

[31]Department of Agriculture Animal and Health Plant Inspection Service Veterinary Services, "Questions and Answers: Animal Disease Traceability Final Rule," 1.

[32]Department of Agriculture Animal and Plant Health Inspection Service, *Federal Register 78, no. 6, Part IV*, 2040, http://www.aphis.usda.gov/newsroom/2012/12/pdf/traceability_final_rule.pdf (accessed July 25, 2013).

[33]Ibid., 2040.

Members of the agricultural community commented on the proposed changes just as they did during the late 1960s when brucellosis eradication program officials suggested amending the Federal Register. Like those cattle owners, commentators wanted modifications to the proposal that favored their industry practices and allowed for free movement of animals. Some of these statements were similar to the ones cattle owners had about the voluntary identification program. Livestock owners wanted flexibility in allowed methods of identification. They wanted to make sure that the process would be cost-efficient and fully funded, and they wanted that certain exception for types of livestock would be made.[34] Department of Agricultural officials took some of these comments into consideration and compromised on the surveillance plan in order to gain the support of the livestock industry. Along with eartags, livestock owners could use tattoos, brands, and backtags as valid sources of identification for their animals and certain chicks and beef cattle under 18 months were exempt from the program.[35] The USDA provided livestock owners with metal eartags at no cost and assisted states with funding for data storage and analysis in order to allay livestock owners concerns about cost.[36] The amended identification plan went into effect March 2013 creating federal law that supported the brucellosis monitoring effort by making it easier to identify reactor cattle and trace their points of contact with other animals.

Though the eradication program ended with the elimination of *Brucella abortus* in the domesticated cattle population in 2012, it transformed into a monitoring program that continued to utilize many of the same strategies as the state-federal eradication cooperative did in the twentieth century. The brucellosis monitoring plan tested cattle across the country and all parts of the industry but implemented more testing in the range area around Yellowstone. The risk of *Brucella* exposure from

[34]Ibid., 2043-2058.
[35]Department of Agriculture Animal and Health Plant Inspection Service Veterinary Services, "Questions and Answers: Animal Disease Traceability Final Rule," 1-2.
[36]Ibid., 5-6.
Department of Agriculture Animal and Plant Health Inspection Service, *Federal Register 78, no. 6, Part IV*, 2059.

park bison also expanded the control effort from livestock to wild animals. The Department of Agriculture and states continued to create and modify brucellosis policy in the early twenty-first century and those policies were influenced by economic concerns, politics, scientific and technological advances, the biology of the bacteria, industry practices, and social and cultural norms. Different groups such as cattle owners, conservationists, Native American groups, veterinarians, and animal health officials wanted brucellosis policy to be built based on their concerns. The surveillance program and bison *Brucella* control program grew out of the twentieth century brucellosis eradication program inheriting much of the earlier program's strategies and its system of developing policy.

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