Texas A&M AgriLife Research

Eradicating Cattle Fever Ticks: New Threats, New Challenges

Background

Protecting the national cattle herd from Texas cattle fever is a critical issue for food security, marketability, and sustainability of the U.S. cattle industry. Cattle fever ticks were once found across 14 southern states and constrained the development of our country's livestock industries. Application of early scientific discoveries through state and federal eradication programs eliminated cattle fever ticks, and thus Texas cattle fever, by the middle of the 20th century. This success provides today's cattle industry $3 billion per year in savings from direct and indirect economic losses due to ticks and disease. Texas ranks first nationally in cattle and calf production, and the Texas beef industry has the highest impact of agricultural production and agribusiness on the state's economy.

Yet cattle fever ticks are expanding their range. New barriers to detection, containment, and elimination of cattle fever ticks include the following challenges:

- Pesticide resistance
- Involvement of wildlife as alternate tick hosts
- Changing patterns in land use
- Impacts of wet-dry climatic cycles

The pathogens that cause Texas cattle fever are transmitted from infected to noninfected cattle by two closely related tick species known as "cattle fever ticks." There are no vaccines or drugs available to prevent or cure Texas cattle fever. Expected mortality to Texas cattle fever in our national cattle herd is estimated to be greater than 70% in infected animals. Eliminating the ticks prevents the disease.

A Re-emerging Problem

Cattle fever ticks and the pathogens of Texas cattle fever are endemic in Mexico, and there is a constant threat that they will become re-established in the United States. In recent years, our country has once again seen the spread of cattle fever tick infestations. This expansion threatens the cattle industry, particularly the more than 400,000 cattle raisers in the southern region who produce one-third of all fed cattle in the United States. Landowners and producers whose cattle are quarantined for fever tick infestations face compliance costs, risk to enterprise sustainability, significant costs in time and labor, and loss in productivity.

Texas is Central to Finding Solutions

Our scientific expertise, experience with cattle fever ticks, and geography place Texas at the front line of defense against tick invasion into the southern region of the United States. Eight Texas counties adjacent to the Rio Grande are directly exposed to cattle and wildlife from Mexico that may be routinely infested with cattle fever ticks. Within those eight counties is a permanent quarantine zone that is regulated by USDA APHIS Veterinary Services and the Texas Animal Health Commission (TAHC). Texas also has a statewide tick-surveillance program operated by the TAHC to detect, contain, and eliminate cattle fever tick infestations that occur away from the border.

In response to the threats and challenges from cattle fever tick infestations, Texas A&M AgriLife Research is collaborating with the USDA Agricultural Research Service and many other stakeholders to provide both short- and long-term solutions through discovery of new methods of detecting, containing, and eliminating cattle fever ticks.

Objectives

- Develop a systems approach to integrate tick-elimination tactics for cattle and wildlife based on tick population dynamics, distribution, and risk of spread.
- Improve diagnostic detection of tick-infested/infected animals and pastures.
- Develop new anti-tick treatments for cattle, wildlife, and pasture applications.
- Optimize treatment strategies for effective tick control and reduced burden on producers and landowners.

Benefits

- Improvement of the slow, risky process of manually detecting ticks on animals
- New and optimized anti-tick measures
- Expanding treatment options for wildlife tick hosts
- Location and removal of isolated populations of ticks
- Novel tactics and strategies based on the complete tick-host system

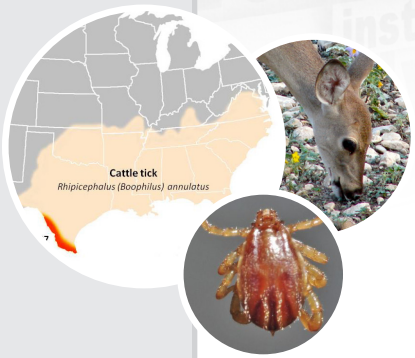
Eradicating Cattle Fever Ticks

The Problem

- In the 1800s, Texas cattle fever killed 70%–90% of cattle infected as adults
- Cattle fever ticks eradicated in 1947
- Cattle fever ticks now advancing into Texas
- 500,000 additional acres under quarantine

Causes

- Changes in land use
- Impacts of wet-dry climatic cycles
- Difficulty tracking tick populations
- Expansion of native and exotic game
- Tick resistance to pesticides



AgriLife Research Projects

- Developing integrated systems for cattle fever tick eradication
- Improving diagnostic detection of tick-infested/infected animals and pastures
- Guiding the development of new anti-tick treatments
- Discovering complementary anti-tick measures

Successful Outcomes

- Protecting the U.S. cattle industry
- Securing the U.S. food supply
- Improving the well-being of livestock and wildlife

Collaboration

Texas A&M AgriLife Research cattle fever tick research is done in cooperation with the USDA Agricultural Research Service, USDA APHIS Veterinary Services, Knipling-Bushland U.S. Livestock Insects Research Laboratory, the Texas Animal Health Commission, Texas A&M University-Kingsville, the Texas A&M AgriLife Center for Genomics and Bioinformatics, the Texas A&M AgriLife Extension Service, Texas A&M AgriLife Grazing Animal Nutrition Laboratory, the Texas A&M University College of Agriculture and Life Sciences, Texas A&M University College of Veterinary Medicine and Biomedical Sciences, and Texas A&M Veterinary Medical Diagnostic Laboratory.

Texas A&M AgriLife Research

Dr. Craig L. Nessler, Director
600 John Kimbrough Blvd., Suite 512
2142 TAMU
College Station, TX 77843-2142
Phone: (979) 845-8486
Email: cnessler@tamu.edu
AgriLifeResearch.tamu.edu

Member of the Texas A&M University System

Texas A&M AgriLife

What is AgriLife? It's a simple word for a diverse organization. With teaching, research, extension education, laboratory, and forestry facilities throughout Texas, we serve people of all ages and backgrounds. Led by Dr. Mark A. Hussey, Vice Chancellor for Agriculture and Life Sciences, Texas A&M AgriLife includes the Texas A&M AgriLife Extension Service, Texas A&M AgriLife Research, Texas A&M Forest Service, and the Texas A&M Veterinary Medical Diagnostic Laboratory.

Texas A&M AgriLife Research

Eradicating Cattle Fever Ticks: Short- and long-term goals

Critical Research Needs for Short-Term Productivity

Texas A&M AgriLife Research and USDA Agricultural Research Service laboratories have made significant progress in discovery and development of new technologies and methods for application against cattle fever ticks. However, these advancements need to be accelerated toward final testing and evaluation before they can be considered for implementation in field operations of the Cattle Fever Tick Eradication Program. Often, this means moving concepts and discovery from laboratory to field-testing to program implementation. The following research topics have deliverable technologies and/or methods that could be implemented within 1 to 2 years provided that additional research funding was available for accelerated progress.

Short-Term Research Advancements

- **Improving diagnostic detection of tick-infested animals and pastures**
  - Employ unmanned aerial vehicles (UAVs) and satellite imagery for mapping tick habitats and assessing animal census data.
- **Guiding the development of new anti-tick treatments**
  - Evaluate and employ new pesticides and formulations to improve efficacy and reduce treatment schedules and scheduled-treatment costs.
  - Track pesticide resistance in cattle fever ticks and respective genotypes.
  - Identify tick origin and pesticide resistance through population genetics of each infestation.
  - Evaluate new anti-tick vaccines for efficacy, longevity, and efficiency of treatment.
- **Discovering complementary anti-tick measures**
  - Optimize applications of anti-tick vaccines and pesticides for efficacy of tick elimination and reduced burden on landowners and producers.
  - Develop testing procedures to speed identification of potential complementary anti-tick measures.
- **Developing integrated systems for cattle fever tick eradication**
  - Employ, test, and evaluate joint strategies for cattle and wildlife.
  - Map tick habitat types on affected landscapes.
  - Track tick populations by climate data monitoring.
  - Link surveillance and epidemiological assessments.
  - Compare costs and benefits.

Long-Term Research Commitment

Preventing the re-establishment of cattle fever ticks in the United States is a long-term commitment and will require continuous and long-term research investments to stay ahead of new challenges. For example, changes in tick susceptibility to pesticides and other control technologies, in wildlife involvement, in land use, and in climate variation will continue to pose challenges to cattle fever tick detection, containment, and elimination. Scientific discovery and development of new technologies is often complex, requiring time-consuming efforts at each step. The following research topics are being investigated, with horizons for new discoveries likely to exceed two years.

Long-Term Research Advancements

- **Improving diagnostic detection of tick-infested/infected animals and pastures**
  - Use tick-induced changes in animal physiology for novel diagnostic indicators of cattle fever tick infestation.
  - Develop robotic/chemosensory systems for tick detection in pastures.
  - Identify molecular-based diagnostics to detect *Babesia* infection.
- **Guiding the development of new anti-tick treatments**
  - Employ advanced bioinformatics to compare the genetic codes of both cattle fever tick species to identify targets for development of new classes of pesticides and anti-tick vaccines.
  - Identify new anti-tick treatments for application to key wildlife species.
  - Develop treatment delivery methods for wildlife species.
  - Conduct field trials to test implementation and evaluate treatment performance for both cattle and wildlife applications.
- **Discovering complementary anti-tick measures**
  - Evaluate complementary anti-tick measures in both cattle and wildlife applications.
  - Develop collaborative international partnerships on innovative anti-tick vaccine technology and evaluation.

Long-range strategic research planning on cattle fever ticks is a joint interest of the stakeholders in Texas and the southern region of the United States. Eradication of the cattle fever tick is also of joint interest to the United States and Mexico. The U.S.-Mexico Binational Committee, composed of state, national, and industry stakeholders, provides a forum to share information and design mutually beneficial responses, research strategies, and goals.