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animal behaviorists, microbiologists, livestock economists, and veterinary and livestock cooperative extension specialists. Texas A&M University is the lead institution for this project.

“Our goal is to integrate research, education, and extension activities to develop cost-effective genomic and management approaches to reduce the incidence of pneumonia in beef and dairy cattle”

What is Bovine Respiratory Disease Complex (BRDC)?

Bovine respiratory disease complex (BRDC), also referred to as pneumonia or shipping fever, is the leading natural cause of death in U.S. beef and dairy cattle, causing the annual loss of more than one million animals and financial losses in excess of \$700 million. Bovine respiratory disease is considered a complex, because many different viral and bacterial pathogens are known to be involved in causing disease symptoms.

Newly-available genomic tools offer an opportunity to employ novel genetic approaches to select for cattle that are less susceptible to disease. Decreasing the incidence of bovine pneumonia is much-needed given increasing concern about food animal welfare and the use of therapeutic treatments. Incorporating disease-resistance into breeding programs offers a sustainable, long-term approach to reducing disease incidence and improving animal health.



What is the BRDC Coordinated Agricultural Project?

Coordinated Agricultural Projects (CAP) are large-scale USDA National Research Initiative (NRI) awards intended to promote collaboration, open communication and exchange of information and coordination of activities among individuals, institutions, states, and regions. CAP participants serve as a team that conducts targeted research, education, and extension in response to emerging or priority area(s) of national need.

The BRDC CAP features a unique interdisciplinary team of veterinarians with bovine respiratory disease complex experience in both dairy and beef cattle, geneticists (with specialties in animal health, disease, immunology, epigenetics, and quantitative genetics), epidemiologists,



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RESEARCH OUTLINE

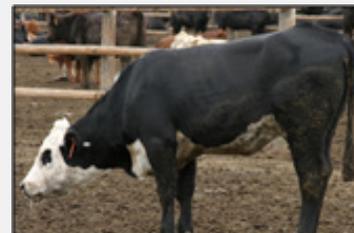
- Identify loci associated with BRD resistance/susceptibility in beef and dairy cattle
 - 2000 dairy calves diagnosed as either a BRD case or control on a collaborating dairy calf rearing ranch (CA) will be genotyped with a high density SNP chip genotyping assay
 - 2000 feedlot cattle diagnosed as either a BRD case or control on a collaborating feedlot (TX) will be genotyped with a high density SNP chip genotyping assay
 - Genotypes from 1000 dairy (NM) and 1000 beef (NV) case:control animals will be used to validate loci associated with BRD in the discovery populations
- Identify the interaction of genetic background of host with BRD pathogens
 - Host response to challenge studies with the seven main pathogens associated with BRDC (*Mycoplasma* spp., *Mannheimia haemolytica*, *Pasteurella multocida*, *Histophilus somni*, bovine viral diarrhea (BVDV), infectious bovine rhinotracheitis (IBR), and bovine respiratory syncytial virus (BRSV)) will be assessed using RNA-seq whole-transcriptome shotgun sequencing
- Develop estimated transmitting values (PTA/EPDs) for susceptibility to BRD
- Develop a BRD diagnostic assay based on the genome sequence of BRD pathogens
- Determine the impact of nonsteroidal anti-inflammatory therapies (NSAIDs) on severity and duration of BRD episodes
 - Behavioral and physiological changes associated with BRD will be determined along with how NSAID therapy affects these responses in animals

EDUCATION OUTLINE

- Develop a nationally accessible distance-learning course on the integration of animal health management with genomic and animal breeding approaches to reduce livestock disease
- Develop an undergraduate summer research internship program to expose and train students in multidisciplinary integrated research to reduce BRD prevalence
- Develop a veterinary feedlot and dairy internship program
- Sponsor graduate and undergraduate students to attend the Southern Great Plains Dairy Consortium where extension and research activities will be ongoing
- Develop a 4-H curriculum to expose and train youth on animal disease using BRD as an example application

EXTENSION OUTLINE

- Utilize existing extension networks to integrate producers, industry, veterinarians, researchers, graduate and veterinary students into the conduct and interpretation of the research trials
- Enhance eXtension by contributing new content in the area of BRD information
- Determine the economic cost of BRD to dairies and feedlots and develop stochastic bio-economic models for the net cost-benefit evaluation of implementing strategies for reducing the prevalence and severity of BRD
- Develop and deliver educational programs on best management practices for integrated and economically sustainable animal health management, genomic, and animal breeding approaches to reduce BRD
- Develop video clips describing diagnosis and management approaches to decrease the incidence of BRD will be developed for viewing and distribution via various outlets including YouTube, eXtension, and the National Cattlemen's Beef Association (NCBA) TV show "Cattlemen to Cattlemen"



Our long-term goal is to reduce the incidence of BRD in beef and dairy cattle with resultant improvements in farm animal welfare and industry profitability by:

- Capitalizing on recent advances in genomics to enable novel genetic approaches to select for cattle that are less susceptible to disease
- Developing improved DNA-based tests for disease diagnosis
- Producing and delivering a variety of educational materials for beef and dairy cattle producers, and feedlot personnel on best management practices to reduce disease
- Providing educational opportunities for undergraduate, graduate and veterinary students to generate a future human resource for the continued reduction in BRD incidence

For more information go to
www.brdcomplex.org