Integrated Program For Reducing Bovine Respiratory Disease Complex In Beef And Dairy Cattle

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Objectives

The long-term goal of this CAP is to reduce the prevalence of BRD in beef and dairy cattle with resultant improvements in animal welfare and industry profitability. Advances in molecular genetics and genotyping technology offer a unique opportunity to identify genetic variation associated with the spectrum of bovine respiratory disease (BRD) pathogens. Success with this project will pave the way for marker-assisted selection and novel genomic selection approaches to genetically complement animal health management practices aimed at minimizing BRD occurrence. This CAP consists of Research, Extension and Education components, all targeted to the overall project goal. The research objectives are to identify genetic loci and genomic rearrangements associated with BRD and use these to develop SNP-based selection tools and diagnostic tests to identify BRD genetically resistant animals. The extension objectives are to develop a sustained effort to disseminate, demonstrate, evaluate and document the impact of a range of educational outreach materials and best management practices for beef and dairy cattle producers and feedlot personnel. The education objectives are to develop and offer distance and experimental multidisciplinary learning approaches for undergraduate, graduate, and veterinary students studying BRD.

Results: Research

GWAS: The genotyping of 2000 dairy calves (from approximately 100,000 animals screened for BRD) has been completed and preliminary GWAS analysis performed. Data have been analyzed independently in three laboratories and more than a dozen moderate to strong associations identified on at least six different chromosomes. Collection from another 1000 dairy animals is nearing completion and a comparable sized study from feedlot steers has begun.

Challenge Studies: Challenge experiments with viral pathogens BRSV, IBR and BVD and bacterial pathogens, Mycoplasma bovis, Mannheimia hemolytica, and Pasteurella multocida were completed. Extensive clinical data have been collected from six steers individually challenged with each pathogen and host response is currently being evaluated at the gene level with RNA-Seq.

Animal behavior is being evaluated in replicates of steers infected with BRSV.

Summary of Differential Gene Expression Analysis with RNA-Seq and DAVID Annotation

Metagenomics studies have been initiated to identify novel pathogens, both bacterial and viral, in cattle with BRD. Current work involves the evaluation of deep pharyngeal and mid nasal swabs and methodology for DNA and RNA isolation.

Results: Extension

Extension activities include the development of a BRD CAP website (http://brdcomplex.org), a workshop at the National Cattlemen’s Beef Association (NCBA) Cattlemen’s College, and the development of a dairy risk assessment tool prototype. A number of presentations were given at various scientific, veterinary, and producer venues to introduce the concept of the BRD CAP and discuss the value proposition of including BRD as a trait in selection indexes. A large number of Presentations, Press Articles, Videos, Papers, Abstracts, and Posters are available to students, producers, and researchers on the BRD CAP website.

Results: Education

The BRD team has developed major roles in the SGPDC (left) and the BGGEO (below). Research and extension components have produced opportunities for undergraduate, graduate and postdoctoral training.

Breeding and Genetics Graduate Education Online. http://bggeo.iddf.iit.edu/courselistings.php

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