Investigation of the Role of Bovine Viral Diarrhea Virus in Undifferentiated Fever of Feedlot Cattle

P. T. Guichon, *DVM*[5]; **D. Haines,** *DVM, M. Phil, PhD*[1]; **M. Campos,** *MVZ, DVM, MSc, PhD*[4]; **C. W. Booker,** *DVM, MVetSc*[5]; **G. K. Jim,** *DVM*[5]; **O. C. Schunicht,** *DVM, BSc*[5]; **B. K. Wildman,** *DVM*[5]; **T. J. Pittman,** *BSc Agri, DVM, PAg*[5]; **R. K. Fenton,** *DVM*[5]; **E. D. Janzen,** *DVM, MVS*[5]; **J. A. Ellis,** *DVM, PhD, ACVP, ACVM*[1]; **G. Appleyard,** *BSc, MSc, PhD*[2]; **K. West,** *DVM, PhD*[3]

[1]*Department of Veterinary Microbiology, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, Saskatchewan*

[2]*Departments of Veterinary Pathology and Veterinary Microbiology, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, Saskatchewan*

[3]*Immunology and Virology Laboratories, Prairie Diagnostic Services, Saskatoon, Saskatchewan*

[4]*Immunaxis Inc., Bragg Creek, Alberta*

[5]*Feedlot Health Management Services, Okotoks, Alberta*

Introduction

The undifferentiated fever (UF)/bovine respiratory disease (BRD) complex continues to be the single most important infectious disease entity in beef feedlot production. Current management practices have focused on successfully managing this disease complex through the use of prophylactic and therapeutic antimicrobial strategies. However, there are substantial amounts of concrete and circumstantial epidemiologic, pathologic, serologic and immunologic evidence of an association between bovine viral diarrhea virus (BVDV) and the UF/BRD complex. Unfortunately, there are limited data that describe how the transmission of BVDV in the feedlot occurs and how this transmission leads to the development of UF/BRD. The purpose of the proposed project is to improve our understanding of the role that BVDV plays in the pathogenesis of pen-level UF/BRD, through the development/refinement of diagnostic tests for identifying and differentiating animals with BVDV, so that appropriate management intervention strategies can be developed to reduce BVDV transmission/infection in commercial feedlot production. In the first phase of the study, population-based, morbidity-based and mortality-based BVDV testing surveys will be conducted in a population of 40 pens (approximately 12,000 animals) of auction-market derived feedlot calves, housed in four commercial feedlots. The results of the BVDV testing surveys, in conjunction with the individual-animal based computerized health records collected at the feedlot, will be used to describe BVDV transmission/infection in pens of commercial feedlot animals.

Materials and Methods

Upon arrival at the feedlot, blood sample and a skin biopsy will be obtained from all animals in the candidate pens (population-based BVDV survey). The blood sample will be submitted for PCR testing (pooled PCR testing followed by individual animal determination in positive pools), and the skin biopsy from PCR positive animals will be submitted for IHC to distinguish between animals PI with BVDV and animals acutely infected with BVDV. The role that PI animals have on UF/BRD morbidity will be determined from the computerized animal health data collected at each feedlot. Additionally, animals from the candidate pens identified by the animal health personnel as new cases of UF/BRD in the first 30 days of the feeding period will be presented to the hospital facility for treatment and sample collection (morbidity-based BVDV survey). Animals that meet these criteria will have a blood sample collected at the time of treatment for UF/BRD. The blood sample will be submitted for PCR testing as described above. The IHC samples from the population-based assays described above will be used to distinguish between animals PI with BVDV and animals acutely infected with BVDV. Furthermore, all animals that die from the candidate pens throughout the entire feeding period will have tissue samples collected at the time of postmortem examination (mortality-based BVDV survey). Appropriate samples of the skin, ileum, myocardium, lung and synovium will be collected. These samples will be submitted for IHC identification of BVDV. The association between BVDV identification on IHC and cause specific mortality will be determined.

Results

During the fall of 2003, animals in 16 pens (approximately 4,400 animals) at two commercial feedlots were enrolled on the study. Approximately 13% of the study animals were diagnosed as new UF/BRD cases in the first 30 days of the feeding period, and 1.96% of the

study animals died prior to April 30, 2004. The animal health events of all study animals that occur during the feeding period will be followed until the study animals are sent for slaughter. Twelve animals (0.27%) have been identified as persistently infected (PI) with BVDV. To April 30, 2004, seven of these PI animals have died. Three animals died of mucosal disease, one animal died of peritonitis, and three animals died of BRD. The prevalence of PI animals observed at one feedlot was 0.11% with a corresponding overall mortality rate of 1.71%. The prevalence of PI animals observed at the second feedlot was 0.51% with a corresponding overall mortality rate of 2.33%. During the presentation, complete BVDV testing survey results and the complete animal health data will be summarized and the associations between BVDV and morbidity and mortality will be discussed. Additional pens of candidate animals will be enrolled on the study when appropriate study candidates become available in the fall of 2004.

Significance

Results of this study will improve our understanding of the role of PI animals on the transmission and dissemination of BVDV and its subsequent impact on the UF/BRD morbidity and mortality. In addition, the results of this study will improve our understanding of the association of immunohistochemical (IHC) identification of BVDV from postmortem samples and all causes of mortality that occur throughout the entire feeding period.

Prevention of Bovine Viral Diarrhea Virus Persistent Infection after a Heterologous Type 1 or Type 2 Challenge in Animals Vaccinated with a Combination Modified Live Virus Vaccine Containing Bivalent BVDV

K.K. Fogarty-Fairbanks, *DVM, MS*[1,2]; **C.L.Rinehart,** *PhD*[3]; **W.C. Ohnesorge,** *BS*[3]; **M.M. Loughin,** *MS*[4]; **C.C.L. Chase,** *DVM, PhD*[1,2]

[1]*Department of Veterinary Science, South Dakota State University, Brookings SD*
[2]*Rural Technologies Inc, Brookings SD*
[3]*Boehringer Ingelheim Vetmedica, Inc., St. Joseph MO*
[4]*Milliken Associates, Inc., Manhattan, KS*

Introduction

Bovine viral diarrhea virus (BVDV) infections in cattle result in a broad spectrum of clinical syndromes ranging from asymptomatic infections to peracute hemorrhagic disease with high mortality. Acute BVDV infection causes respiratory, gastrointestinal and/or reproductive disease that results in a febrile response along with leukopenia. Due to BVDV shedding, persistently infected (PI) animals are a long term threat to herdmates, and may develop mucosal disease resulting in the death of the animal.

Acute BVDV infection of pregnant cattle with either cytopathic (CP) or noncytopathic (NCP) BVDV can result in a variety of fetal syndromes, depending on the virulence of the strain and age of the fetus. In early gestation, BVDV infection can result in early embryonic death and fetal absorption. Between 40-125 days of gestation, infection with NCP BVDV can result in PI calves that shed NCP BVDV for their entire lives.

The purpose of this study was to determine the efficacy of a commercial MLV combination vaccine containing bivalent BVDV diluted to contain minimum protective levels of BVDV type 1 and 2 in providing fetal protection against a heterologous challenge with type 1 or type 2 BVDV. Two groups of animals were vaccinated with a single dose of the commercial vaccine. Protection against persistent infection of the fetus was measured following challenge.

Materials and Methods

Heifers were vaccinated with either a commercial MLV combination vaccine containing minimum protective levels of type 1 and type 2 BVDV or sham vaccine and bred 44-53 days later. Bred heifers were challenged