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American Association of Bovine Practitioners

Omaha, Nebraska
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September 14-16, 2017

Omaha, Nebraska

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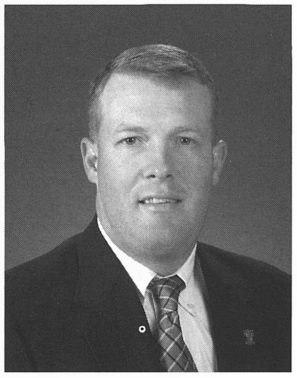

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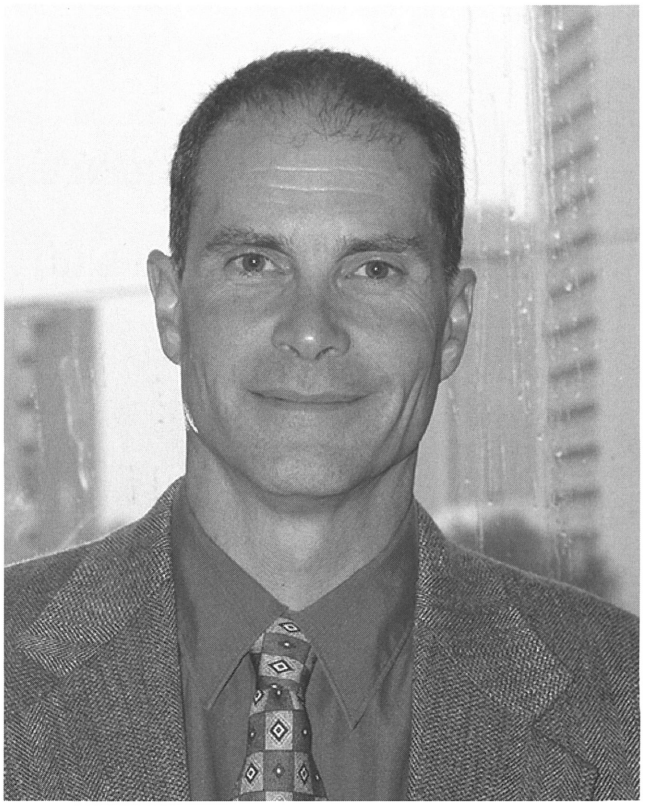

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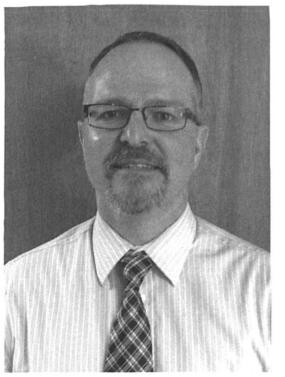

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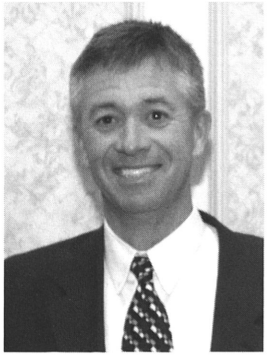

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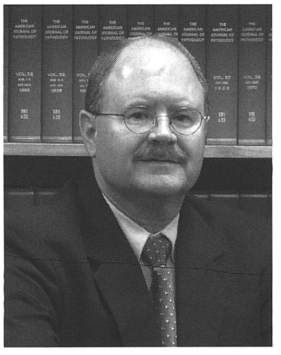

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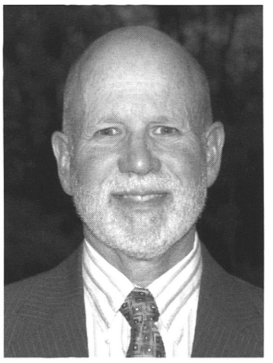

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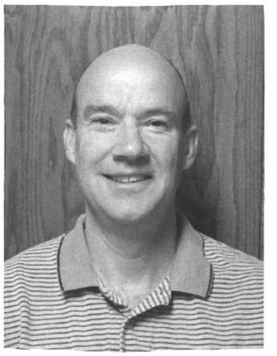

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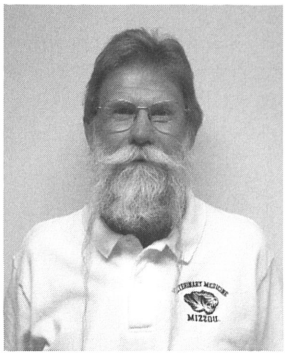

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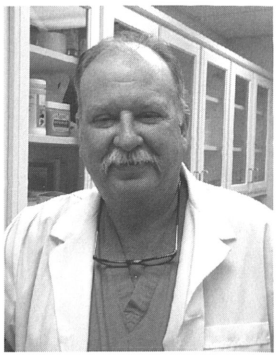

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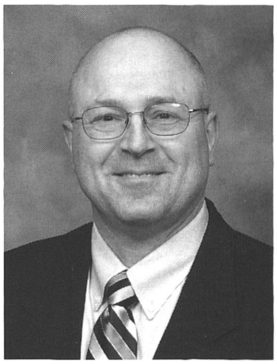

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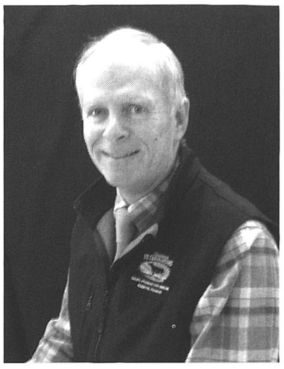

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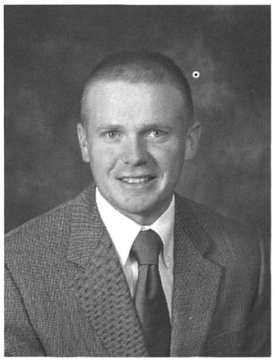

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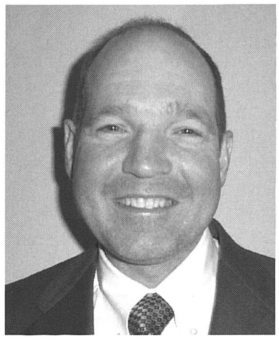

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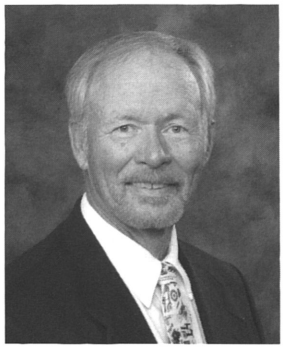

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Elanco Titanium®

TECH REPORT
Elanco research information for beef consultants

Fetal protection against bovine viral diarrhea virus type 1 and type 2 challenge[1,2]

DeRoos, J. and B. Terhaar

Study overview

The purpose of this study was to determine whether heifers vaccinated with a combination vaccine, Bovine Rhinotracheitis-Virus Diarrhea-Parainfluenza$_3$-Respiratory Syncytial Virus Vaccine, Modified Live Virus, *Leptospira Canicola-Gripptotyphosa-Hardjo-Icterhaemorrhagiae-Pomona* Bacterin, were protected against the development of persistently infected (PI) calves following exposure to virulent type 1 and type 2 bovine virus diarrhea virus (BVDV).

Exposure of susceptible, pregnant cattle to BVDV early in their pregnancy often results in embryonic death and resorption. Infection of susceptible pregnant cattle with a non-cytopathic (NC) BVDV early in their pregnancy (40 to 125 days) can result in abortion, resorption or the delivery of a PI calf.[3]

Experimental design

- The study was performed at RTI (Rural Technologies Inc.) in cooperation with the South Dakota State University diagnostic laboratory
- All heifers were seronegative to BVDV type 1 and BVDV type 2 and, negative for BVDV PI by skin test via immunohistochemistry
- Heifers were randomized to one of four treatment groups:
  - Group A (vaccinate) — Vaccination with Titanium® 5 L5 HB and Type 1 BVDV challenge
  - Group B (control) — Vaccination with a 5-way leptospira HB vaccine and Type 1 BVDV challenge
  - Group C (vaccinate) — Vaccination with Titanium 5 L5 HB and Type 2 BVDV challenge
  - Group D (control) — Vaccination with a 5-way leptospira HB vaccine and Type 2 BVDV challenge

Angus cross heifers (n=104) were enrolled in this study for the vaccination and breeding events. The study investigator and all laboratory personnel were blinded with respect to treatment allocation. Additionally, individuals making the clinical observations were blinded as to the treatment group allocations. The heifers were double ear-tagged and metal ear-tagged then randomly assigned (by using the RAND function in Microsoft EXCEL) to either Treatment Group A, B, C or D.

For inclusion in the trial, the heifers were not pregnant at Study Day (SD) 0 and all animals were shown to be seronegative for BVD type 1 and BVD type 2 (< 1:2 serum neutralization titer). Only heifers seronegative for BVD, as described above, and found to be PI-negative by ear notch immunohistochemistry (performed by the Veterinary Diagnostic Laboratory, Iowa State University) were included in the trial.

Heifers in Groups A and C (n=69) were vaccinated with a single 2 mL SQ dose of Titanium 5 L5 HB according to label directions. Heifers in Groups B and D (n=35) were vaccinated with a 2 mL SQ dose of a 5-way leptospira HB according to label directions (Groups B and D).

Heifers were heat synchronized for artificial insemination on Study Day 32.

Treatment Group	Number of Head	Challenge Virus
A Titanium 5 L5 HB	21	BVDV NC type 1
B 5-way leptospira HB	11	BVDV NC type 1
C Titanium 5 L5 HB	24	BVDV NC type 2
D 5-way leptospira HB	11	BVDV NC type 2

Heifers were confirmed pregnant by ultrasound on Study Day 122 and were also palpated prior to challenge. At the time of the ultrasound, 67 heifers were confirmed pregnant and at the correct fetal gestational age to be enrolled in the challenge phase of the trial. Heifers were between 71 and 90 days of gestation on the day of challenge. Heifers in Groups A and B received an intranasal challenge of virulent NC BVDV type 1 (strain BJ). Heifers in Groups C and D received an intranasal challenge of virulent NC BVDV type 2 (strain PA 131). Heifers in all groups were examined daily for visual signs of abortion.

Between 71 and 81 days post-challenge, heifers were slaughtered and fetuses were harvested. Heart, blood, spleen, thymus and cerebellum were collected from each fetus for challenge virus isolation. PI fetuses were defined by viral isolation from tissues sampled at fetal harvest or at necropsy. Also, any abortion, resorption or open heifer following challenge was considered as a PI fetus unless definitively demonstrated to be unrelated to the challenge organism.

The individual animal was included at the experimental unit. Differences between the treatment groups were deemed statistically significant if $P < 0.05$. The primary outcome variable (percent of PI fetuses) was evaluated using Fisher's exact test. If a treatment effect was detected, the prevented fraction (PF) and the 95% confidence interval around the PF were estimated.

Results

The BVDV type 1 challenge was given to treatment groups A and B. BVDV type 1 was isolated from nine out of 11 (81.8%) fetuses from the BVD negative control (Group B) heifers. In the BVD vaccinate group A, 2 out of 21 (9.5%) fetuses were BVDV positive. There was a significant decrease in the number of BVDV PI fetuses in the vaccinate group. The PF from the statistical analysis was 0.8889.

The BVDV type 2 challenge was given to treatment groups C and D. BVDV type 2 was isolated from 11 out of 11 (100%) fetuses from the BVD negative control (Group D) heifers. BVDV type 2 was isolated from two out of 24 (8.3%) fetuses from the BVD vaccinated (Group C) heifers. There was a significant decrease in the number of BVDV PI fetuses in the vaccinate group. The PF from the statistical analysis was 0.9167.

Percentage of PI fetuses

Treatment Group	Challenge Virus	% PI Fetuses
A Titanium 5 L5 HB	BVDV NC type 1	9.5
B Control	BVDV NC type 1	81.8
C Titanium 5 L5 HB	BVDV NC type 2	8.3
D Control	BVDV NC type 2	100

[1]DeRoos, J. and B. Terhaar. 2002. A Pivotal Efficacy Evaluation of Bovine Rhinotracheitis-Virus Diarrhea-Parainfluenza3-Respiratory Syncytial Virus Vaccine, Modified Live Virus, Leptospira Canicola-Gripptotyphosa-Hardjo-Icterhaemorrhagiae-Pomona Bacterin, APHIS Product Code 4461.20, in support of Fetal Protection Claim for BVDV type 1. Diamond Animal Health.
[2]DeRoos, J. and B. Terhaar. 2002. A Pivotal Efficacy Evaluation of Bovine Rhinotracheitis-Virus Diarrhea-Parainfluenza3-Respiratory Syncytial Virus Vaccine, Modified Live Virus, Leptospira Canicola- Gripptotyphosa-Hardjo-Icterhaemorrhagiae-Pomona Bacterin, APHIS Product Code 4461.20, in support of Fetal Protection Claim for BVDV type 2 Virus. Diamond Animal Health.
[3]Goens, S. 2002. The evolution of bovine viral diarrhea: a review. 43: 946-954.

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