Evaluating the Efficacy of a *Haemophilus Somnus* Bacterin in a Controlled Field Trial

R. L. Morter, *D.V.M.*
H. E. Amstutz, *D.V.M.*
Department of Large Animal Clinics
School of Veterinary Medicine
Purdue University
West Lafayette, Indiana 47907

Serological evidence indicates a widespread distribution of *Haemophilus somnus* in cattle herds commonly causing an inapparent infection.[1] Early reports established the etiologic relationship of *H. somnus* and infectious meningoencephalitis of cattle.[2] The role of *H. somnus* in bovine respiratory disease (BRD) has been accepted.[3] *H. somnus* bacterins given in 2 doses 14 days apart stimulated protective immunity against IV challenge in 100% of the vaccinates, as compared to an 80% incidence of systemic infection in the controls.[4] Two field trials with a commercially available bacterin, Somnugen®, produced conflicting results. In 1 trial, the incidence of BRD was one-third less in the vaccinates than the controls, while in a second trial the incidence was the same in both groups.[5,6] A controlled field trial was designed to evaluate the efficacy of Somnugen in reducing the incidence and severity of BRD in feedlot cattle.

Material and Methods

An order buyer in Kentucky purchased 320 crossbred steers of unknown background. The steers were processed at the time of arrival at the feedlot; ear tagged, implanted, weighed individually, injected IM with 2.5 M units of vitamin A, vaccinated intranasally with a modified live virus for infectious bovine rhinotracheitis and parainfluenza 3 as well as IM with a heptavalent clostridial bacterin-toxoid and dewormed with levamisole.

A random number program generated the assignment of the steers to 1 of 18 pens and 1 of 3 treatment groups. Each treatment was replicated 6 times, with 17 steers per pen. Fourteen steers were excluded from the study because of weight or clinical disease. The treatments were: unvaccinated controls, vaccinated at the time of processing, and vaccinated at the time of processing and revaccinated 21 days later.

The receiving ration was good quality mixed legume grass hay plus 1 pound of rolled corn and 1 pound of natural protein supplement per head per day. After 4 days, both the corn and supplements were increased to 2 pounds. On day 10, corn silage was introduced and increased daily for 3 days as the hay was withdrawn. During the rest of the 40 day trial, corn was increased and silage decreased, with a final intake of 5 to 6 pounds of corn per head per day, 2 pounds of supplement and silage to appetite. The daily ration for each pen was weighed and feed not consumed periodically weighed back.

All steers were observed daily and any with clinical signs of BRD were examined individually. Some steers with rectal temperatures of less than 104° F., but other clinical signs of BRD were put on treatment. Nasal swabs collected from 28 steers at the time of the first treatment for BRD were submitted for microbiologic examination.

All cattle were bled at the time of processing and 40 days later, to provide paired serum samples. The *H. somnus* serology was provided by Philips Roxane, Inc., St. Joseph, Missouri. The cattle were also weighed on day 40, the conclusion of the trial.

Results and Discussion

The initial geometric mean titers (GMT) for *H. somnus* agglutinins were not significantly different between the treatment groups; control 39, vaccinated once 37, and vaccinated twice 39 (P less than 0.00001). The GMT by pens ranged from 26 to 49. One steer was seronegative and 19 had titers >126. The GMT increased significantly in all groups (P less than .00001). The final GMT of the control group, 111, was significantly lower than the 137 for both of the vaccinated groups (P less than 0.01).

The GMT of the initial sera plus finding only 1 seronegative steer verifies the ubiquitous nature of *H. somnus* in beef cow herds, at least in the population represented by the herds of origin of these 306 steers. The significant increase in titers in the control steers suggests that *H. somnus* must have been circulating within this group, either from exposure in trade channels or from

Submitted as Journal Paper No. 9531, Purdue Agricultural Experiment Station, West Lafayette, Indiana 47907

Supported in part by Philips Roxane, Inc., St. Joseph, Missouri, 64502

® *Philips Roxane, Inc., St. Joseph, Missouri, 64502.*

carrier animals within this group. The rise in titer did not correlate with the incidence of BRD in this group, as the initial GMT for the steers treated for BRD was 44 and final 121, not significantly different than the 39 and 111 for the group as a whole. Most of the changes in titer were only 1 or 2 dilutions. However, the titers of 5 of the treated steers increased 3 or more dilutions. This subset of 5 steers had a low initial GMT of 9.2 and a final of 158, a change great enough to be attributed to active infection with *H. somnus* during the course of the trial.

The finding of identical final GMT in the single vaccinated group and the revaccinated group was unexpected. The basis for the label instructions on bacterins to revaccinate in 21 days is to provide better protecti immunity. The first vaccination introduces the antigens to the immune system, initiating an immune response. The second exposure should result in a shorter latent period and a booster response of greater magnitude than the first. This obviously did not occur as the final GMT were identical for the 2 vaccinated groups. Small amounts of antigen can be quickly eliminated by the immunized animal without further stimulation of the immune system. The antigenic mass in bacterins is usually large enough to avoid this. However, the first vaccination could have stimulated production of high levels of IgM, which is extremely efficient in removing particulate material and negated the effectiveness of the revaccination. The immunologically compromised animal may not mount a good response to antigenic stimulation. Twenty one days after arrival, the incidence of BRD was very low, the cattle were eating well, and the stress of shipping should no longer have been a factor. It is doubtful if the cattle were immunologically compromised at the time of revaccination.

The incidence of BRD was: controls 34 treated, vaccinated once 49, and vaccinated twice 31. Significantly more animals were treated in the vaccinated once group than in the other groups ($P<0.01$). The average number of treatments per steer with BRD were: 4.94 for the controls, 3.91 for the vaccinated once, and 3.86 for the vaccinated twice. There was no difference between the 2 vaccinated groups, but the controls requires significantly more days of treatment ($P<0.01$). This further indicates that *H. somnus* played some etiologic role in the incidence of BRD in this trial. This was not substantiated microbiologically, as *H. somnus* was not isolated from any of the nasal swabs. *Pasteurella hemolytica* was isolated from 23 of the 28 specimens. All 23 pasteurella isolates were resistant to tetracyclines and sulfonamides, 22 to streptomycin and 21 to ampicillin.

The performance of the three treatment groups did not differ significantly. The average daily gain of the control steers was 2.63 pounds, the vaccinated once 2.57, and the vaccinated twice 2.6. The feed per pound of gain on a dry matter basis was: controls 4.4 pounds, vaccinated once 4.3, and the vaccinated twice 4.3. These values are not significantly different.

Even though *H. somnus* was not isolated, it apparently played some role in the etiology of BRD in the control group as indicated by the significant increase in titers. The presence of *H. somnus* may also explain the significantly greater number of days of treatment for BRD required in the control steers. Revaccination was of no benefit as the titers, the incidence and severity of BRD and performance of the 2 vaccinated groups was the similar. Vaccinating once at the time of processing was cost-effective, as the expense of administering the bacterin to an animal during processing was minimal. This cost would be more than offset by eliminating the expense of the additional day of treatment required in the control group.

References

1. Hoerlein, A.B., Goto, K. and Young, S.: Haemophilus somnus Agglutinins in Cattle. JAVMA, 163: 1375-1377, 1973. 2. Kennedy, P.C., Biberstein, E.L., Howarth, J.A., Frazier, L.M., and Dungworth, D.L.: Infectious Meningo-Encephalitis in Cattle, Caused by a Haemophilus-Like Organism. Am. J. Vet. Res., 21:403-409, 1960. 3. Brown, L.N., Dierks, R.E., and Dillman, R.C.: The Haemophilus somnus complex. In Proceeding, 74th Ann. U.S. Anim. Health Assoc., 94-108, 1970. 4. Williams, J.M., Smith, G.L., and Murdock: Immunogenicity of a Haemophilus somnus Bacterin in Cattle. Am. J. Vet. Res., 39:1756-1762, 1978. 5. Amstutz, H.E., Horstman, L.A., and Morter, R.L.: Clinical Evaluation of the Efficacy of Haemophilus somnus and Pasteurella sp. Bacterins., Bov. Prac., 16:106-108, 1981. 6. Morter, R.L., Amstutz, H.E., and Crandell, R.A.: Clinical Evaluation of Prophylactic Regimens for Bovine Respiratory Disease. Bov. Prac., 17:56-58, 1982.