Clinical Evaluation of the Efficacy of *Haemophilus somnus* and *Pasteurella sp.* Bacterins

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The role of bacteria in the production of acute bovine respiratory disease (BRD) (shipping fever) has long been recognized.[1] [2] Although numerous bacteria have been isolated from the respiratory tracts of affected cattle, *Pasteurella sp.* have been considered to be the major bacterial pathogens for many years[3] while *Haemophilus somnus* has more recently been incriminated as a significant etiologic agent.[4] It has been established beyond any reasonable doubt that *Pasteurella multocida* and/or *Pasteurella hemolytica* is an essential component in the etiology of shipping fever and that the advanced clinical signs, characteristic fibrinous pneumonia and death losses are basically due to pasteurellosis.[3]

Morbidity of respiratory disease is usually high while mortality is low in properly treated animals.[5] Treatment is expensive and time consuming while affected cattle make poor weight gains and death losses can be significant. Because of the above, much time and money have been invested in developing bacterins that would hopefully prevent acute bovine respiratory disease.[5]

Pasteurella bacterins have been available for many years but their efficacy is questionable[6] and they are rarely used today as the sole immunizing agent to prevent bovine respiratory disease. When such bacterins are used they are usually used in conjunction with viral vaccines such as parainfluenza 3, infectious bovine rhinotracheitis and bovine virus diarrhea. Reports have frequently been received that more effective pasteurella bacterins are or soon will be available[7] but the efficacy of those available today is still questionable.

A *Haemophilus somnus* bacterin first became commercially available early in 1978. The initial demand far exceeded the supply and many doses have since been used. Field reports have been complimentary and the authors experience have been good on a limited number of cases. A clinical field trial was undertaken in the fall of 1979 to compare the efficacy of a *H. somnus* bacterin, a bivalent *P. multocida-P. hemolytica* bacterin in reducing the incidence and severity of BRD as compared to unvaccinated controls.

Materials and Methods

Three-hundred and forty heifer calves of mixed beef breeds, purchased by an order buyer in Kentucky, were co-mingled upon arrival at the feedlot. The receiving ration was good quality first cutting mixed orchard grass and alfalfa hay. Three-hundred twenty-four heifers weighing 400 to 600 pounds were assigned to three treatment groups of 108 by a random number table. Animals with signs of clinical illness were excluded from assignment.

Health Processing: All cattle received an intranasal Infectious Bovine Rhinotracheitis vaccine (Nasalgen) (R)[a], an intramuscular Bovine Virus Diarrhea vaccine of porcine cell line origin (Jencine B) (R)[a], 2.5 million units of Vitamin A intramuscularly and were implanted with 36 mg Ralgro. Additionally, treatment group 1 animals received a *Haemophilus somnus* bacterin (Somnugen) (R)[b] and treatment group 2 a *Pasteurella multocida, P. hemolytica* bivalent bacterin (Econ-P) (R)[b] and treatment group 3 were unvaccinated controls. The heifers in treatment groups one and two received a second dose of the respective bacterin 21 days post-primary vaccination.

Ration: Chopped mixed orchard grass and alfalfa with one pound of rolled shelled corn and one pound of soybean meal thoroughly incorporated was fed to appetite the first 2 days following assignment to treatment group. Corn silage was added to the ration on day 3 and the amount of chopped hay progressively reduced daily to withdrawal on day 6. The corn and soybean meal were increased by one-half pound on day five to 1.5 pounds each and another 0.5 pound on day nine. The two pounds per head level of each was maintained for 25 days with the corn silage increased as necessary to keep feed in the bunks twenty-four hours a day. From day 35 on the energy intake was increased incrementally by

[a] Jensen-Salsbery Laboratories, Kansas City, MO 64141

[b] Bio-Ceutic Laboratories, Inc., St. Joseph, MO 64502

adjusting the corn to a maximum of 15 pounds per head per day and reducing the silage proportionately. Trace mineral salt and a mineral mixture were offered *ad libitum*.

Treatment of Respiratory Disease: All heifers were observed daily and any with clinical signs of respiratory disease were removed from the pen for further evaluation. A rectal temperature of 104°F or greater and/or the clinical condition of the animal indicated that antibiotic therapy should be initiated. Five mg of oxytetracycline or 10,000 I.U. of procaine penicillin G per pound of body weight were the primary antibiotics. Animals that did not respond were then treated with triple sulfas I.V. Treatment was continued until the rectal temperature was 103°F or less for 24 to 48 hours or in some cases when further treatment was not considered beneficial.

Microbiology and Pathology: Nasal swabs from the first 19 animals treated and tissues of all animals that died were submitted to the microbiology laboratory for isolation and identification of significant pathogens. All animals that died were necropsied to confirm the cause of death.

Performance Measurement: The animals were weighed individually at the time of arrival, at 34 and 133 days. Treatment groups were weighed in the same sequence and the same time of day relative to the feeding schedule to prevent bias in the performance data.

Results and Discussion

Individual animal weights taken on day 133 concluded the trial. The performance (Table 1) for the 133 day period did not vary between treatment groups with only 0.03 pound difference in average daily gain (ADG). The ADG at the end of the first 34 days indicated better performance in the control group by 0.37 pounds per day. This indicates the problem encountered on evaluation of health management procedures based on limited periods of observation. Evaluation of performance should be evaluated on a normal feed-out period. Cattle that perform poorly during the early part of a trial subsequently make compensatory gains and that frequently equalizes the overall performance. The greater number of animals treated for respiratory disease in two of the treatment groups, vaccinated with the pasteurella bacterin or the unvaccinated control could have been postulated to have influenced overall performance. Such a hypothesis has been based on the effect of residual pulmonary lesions following acute respiratory disease.

Performance of Feedlot Heifers
Vaccination Treatment Group

	H. somnus	Pasteurella sp.	Control
Number of Animals	106	108	107
Initial Average Wt.	500.3	489.6	490.0
34 days			
Ave. Wt.	551.8	544.3	554.4
ADG	1.51	1.60	1.88
133 Days			
Ave Wt.	796.8	799.7	790.5
ADG	2.27	2.26	2.27

The respiratory disease was acute, some animals dying within 24 hours after first being observed ill. The gross lesions were a marked fibrinous pleuritis, a constant finding of consolidation of the anterior, cardiac and frequently the diaphragmatic lobes, major bronchi filled with exudate and clotted blood and in some, a hermorrhagic necrotizing myositis in muscles of the thoracic limbs. The lesions could be considered typical of classic pasteurella hemorrhagic septicemia. The cattle were followed to slaughter. The thoracic viscera in all but one appeared normal as viewed at slaughter. Residual thoracic lesions of adhesions and abscessation in the sternal area were present in only one animal.

The nasal swabs yielded five isolates of *Pasteurella multocida* and 14 of *P. hemolytica*. *Haemophilus somnus* was not isolated. No other pathogens of significance were found.

Clinical respiratory disease was first diagnosed and treated on day 3 post-processing (Table II). The number of animals on treatment increased rapidly reaching a peak on day 12 to 15. Only five animals were placed on treatment after day 18. A few with refractive respiratory disease required protracted treatment extending the total treatment period to day 22 or longer. The course of respiratory disease was typical; a few early cases, dissemination among animals in the lots, a peak number ill approximately 2 weeks after arrival followed by a rapid decrease in the number on treatment during the third week.

FREQUENCY OF TREATMENT FOR RESPIRATORY DISEASE [1]

VACCINATION TREATMENT GROUP	DAY POST PROCESSING																					TOTAL
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22+	
HAEMOPHILUS SOMNUS[2]				2	4	5	5	3	4	6	8	11	10	9	6	5	5	3	2	1		89
PASTEURELLA[3] MULTOCIDA & P. HEMOLYTICA	4	4	5	6	7	9	11	13	11	7	10		8	11	11	9	5	6	5	4	6	6	158
CONTROL		1	3	8	7	8	12	11	14	14	12	11	11	8	5	7	5	7	6	2		152
TOTAL	4	4	6	11	19	21	24	28	26	27	32	31	32	31	23	15	18	13	13	12	8	399

1. All received Nasalgen® (IBR$_1$PI$_3$) and Jenocine® B(BVD): Jensen-Salsbery Laboratories, Kansas City, MO 64141
2. Somnugen® Bio-Ceutic Laboratories, Inc., St. Joseph, MO 64502
3. Encon - P® Bio-Ceutic Laboratories, Inc., St. Joseph, MO 64502

A significant difference ($P<0.01$) in morbidity between treatment groups indicated that vaccination with Somnugen (R) at the time of processing the cattle reduced the incidence of resporatory disease (Table III). Twenty-one animals vaccinated with Somnugen (R) required treatment

compared to 33 in each of the other treatment groups. The vaccination with the pasteurella bacterin did not alter the incidence or number of treatments required as compared to the controls.

Incidence and Treatment of Respiratory Disease

	Vaccination Treatment Group[1]		
	H. somnus[2]	Pasteurella sp[3]	Control
Total Animals	106	108	107
Animals Treated	21[4]	38	33
Total Treatments	89	158	152
x Treatments/Animal	4.3	4.8	4.6
Deaths	3	1	2

1. All received Nasalgen®(IBR_1PI_3): and Jencine®B9(BVD): Jensen-Salsbery Laboratories, Kansas City, MO 64141
2. Somnugen®: Bio-Ceutic Laboratories, Inc., St. Joseph, MO 64502
3. Encon-P®: Bio-Ceutic Laboratories, Inc., St. Joseph, MO 64502
4. Significant: $p < 0.01$

The label instructions for both bacterins indicate revaccination should occur 21 days following primary vaccination. The second vaccination was given on day 21. Thus, any anamnestic effect would not have influenced the incidence of respiratory disease. The bacterins might have been more effective if two doses had been administered at the point of origin. The opportunities to purchase cattle through an order buyer with any degree of assurance of such previous vaccination is limited. The condition in this trial duplicated the usage of bacterins as frequently practiced in mid-west feedlots.

The effectiveness of the *H. somnus* bacterin in a group of cattle from which the organism was not isolated poses the question of mechanism of action. The numbers of *H. somnus* in tissues could have been reduced by antibiotic therapy below the limits of recovery. Previous experience with the organism would have provided basis for an anamnestic response to the first vaccination. The data (Table II) could be interpreted as influenced by an effective anamnestic response by day 9 or 10 post-vaccination resulting in a lower morbidity. The random assignment to treatment groups precluded any inherent bias between treatment groups favoring the *H. somnus* bacterin. The lack of significant differences between groups, e.g. initial weight or average daily gain for 133 days substantiates the lack of between group variability.

It must be recognized that a single trial may not be conclusive and it is planned to replicate the trial.

References

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