THE EFFECT OF LIVE PASTEURELLA HEMOLYTICA VACCINE ON HEALTH AND PERFORMANCE OF NEWLY ARRIVED STOCKER CATTLE

R.A. Smith[1], R.B Hicks[3], D.R. Gill[3], and R.L. Ball[4]

Story in Brief

Five hundred four newly received steer and bull calves and yearlings averaging 530 pounds were divided into two groups. Two hundred fifty-six head received routine processing upon arrival and 248 head received routine processing plus live Pasteurella hemolytica vaccine. Vaccination with live Pasteurella hemolytica vaccine decreased the incidence of sickness by 18% (33.1% for vaccinated cattle vs 40.4% for controls). Sick days also were lower in the vaccinated group (2.2 vs 2.7 days/head) and death loss was decreased by vaccination from 1.2% to 0%. Daily gains were not affected by vaccination in this study.

(Key Words: Pasteurella hemolytica, Bovine Respiratory Disease, Newly Received Cattle)

Introduction

Pasteurella hemolytica has been known to be associated with the shipping fever-bovine respiratory disease (BRD) complex since the 1950's. More recently it was isolated from the pneumonic lungs of feedlot cattle (Martin et al., 1980). It is the most commonly isolated bacterial pathogen from the acutely affected bovine lung (Frank and Smith, 1983).

Over the past 50 years much research as been conducted with Pasteurella bacterins in an effort to control BRD. Wilkie (1980) reviewed studies on the biological control of BRD and concluded that Pasteurella bacterins have no obvious use in control of the disease. Field trials have shown that the bacterins increase morbidity and mortality and decrease weight gains in feedlot cattle (Martin et al., 1980). Recent research with live Pasteurella hemolytica (PH) vaccine has shown more promising results (Purdy et al., 1983). Smith (1983) reported results of field trials in which PH vaccine was used in commercial cattle, preconditioned cattle, and feedlot cattle. It reduced morbidity by 89%, 77%, and 44%, respectively.

The objective of this research was to study the effect of PH vaccine on the health and performance of newly arrived stocker and feeder cattle.

Materials and Methods

Six truck loads (trials) of cattle were purchased by order buyers from auction markets in Georgia, Kansas, Mississippi, Oklahoma, Tennessee, and Texas and shipped to Pawhuska, Oklahoma. The arrival

---

[1]Associate Professor, Veterinary Medicine and Surgery [2]Graduate Assistant [3]Regents Professor [4]Herdsman II

Table 1. Origin, arrival date, number of head, arrival weight, and in-transit shrink for each load of cattle.

Trial	Origin	Arrival Date	Number of Head	Arrival Wt., lb	% Shrink
1	TN	9-30-84	80	550	5.8
2	GA	11-18-84	77	539	9.0
3	MS	2-06-85	91	491	9.7
4	TX & OK	2-12-85	92	519	3.4
5	KS	3-10-85	88	550	4.8
6	KS	3-18-85	76	552	5.1

date and weight, origin, number of head, and in-transit shrink for each load is summarized in Table 1. Newly received cattle were weighed individually off the truck, ear tagged, and treated with Lysoff®[a]. Following weighing and tagging, cattle were randomly divided into two groups and placed in separate pens. Water and native bluestem grass hay were provided free choice. The morning following arrival, the cattle were processed as follows:

1. Body temperature and time were recorded.
2. Cattle were vaccinated with IBR-PI_3 (MLV) IM, Leptospira pomona bacterin and Clostridia chauvoei, septicum, novyi, and sordellii bacterin.
3. Cattle with even-numbered ear tags were vaccinated intradermally with live Pasteurella hemolytica vaccine[b] (.5 ml/head) and those head with odd-numbered ear tags served as controls.
4. Dewormed with ivermectin[c] (200 µg/kg).
5. Cattle were started on antibiotic treatment if clinical signs of illness were detected or if body temperature exceeded 104°F.
6. For sick cattle, a hospital card was initiated and the calf was placed in a hospital pen.

As soon as cattle were placed in their pens, they had ad libitum access to bluestem grass hay and were offered a pelleted feed supplement (Table 2) at a rate of 2 lb/head/day for the first 21 days and 1 lb/head/day during days 22-28. In Trials 2 through 6, a vitamin E supplementation study was superimposed across this vaccine experiment. In each of these trials, one pen of cattle received a feed supplement containing vitamin E (800 IU/lb) and the other pen received supplement without addition of vitamin E (Table 2). Two hospital pens were maintained so that sick animals received their assigned feed while out of their home pen.

After processing, cattle were checked twice daily for signs of illness. If an animal was suspected to be sick, it was moved to the processing area where its body temperature was determined and a severity of illness score (slight, moderate, or severe) was assigned. If the body temperature exceeded 104°F the animal was considered sick. Animals could also be classified as sick based on clinical signs.

[a]Cutter Laboratories, Shawnee Mission, KS 66201.
[b]PRECON-PH®, AGRI-BIO Corp., Gainsville, GA 30501.
[c]Ivomec®, MSD Agvet, Rahway, NJ 07065.

Table 2. Composition of feed supplements.

Ingredient	IFN[a]	% As Fed Control	% As Fed Vitamin E
Soybean Meal	5-20-637	88.9	88.5
Cottonseed Meal	5-01-621	5.0	5.0
Salt	6-04-152	3.0	3.0
Vitamin E - 220,000 IU/kg[b]		0	.4
Vitamin A - 30,000 IU/Gram		.22	.22
Premix[c]		.18	.11
Dicalcium Phosphate	6-01-080	2.75	2.75

[a]International Feed Number.
[b]To provide 800 IU vitamin E/lb.
[c]To provide 75 mg lasalocid/lb.

Medical treatment for sick animals was determined by the ear tag number which was applied at random on arrival. Treatment schedules were (A) a sequence of antimicrobial drugs listed in Table 3 or (B) an experimental potentiated sulfa (RO5-0037[d]) substituted for Treatment 1 in Table 3. Cattle were initially treated with the first drug in the sequence. If body temperature dropped by 2°F or to less than 104°F, or clinical signs were improved within 24 hours, the drug was continued for two more days. If no improvement was apparent within 24 hours, the next drug in the sequence was applied and the procedure repeated until improvement was detected. Cattle treated by schedule B received RO5-0037 boluses orally (30 mg/lb on day one and 15 mg/lb/day thereafter).

At the end of the 28 day trial, the cattle were held overnight without feed or water, weighed the following morning and, when necessary, cattle were castrated and horns were tipped. Cattle were then returned to the owner.

Table 3. Sequence of drugs used for treatment of BRD.

Treatment No 1:	OXYTETRACYCLINE (Biomycin-C®) subcutaneously - 5 mg/lb. Plus SULFAMETHAZINE BOLUSES (15 gm) 1 bolus/150 lb on day 1. One bolus/300 lb on subsequent days.
Treatment No 2:[a]	ERYTHROMYCIN (Gallamycin®) deep in the muscles - 10 mg/lb.
Treatment No 3:[a]	SPECTINOMYCIN (Spectam®) - 5 mg/lb.
Treatment No 4:[a]	Procaine Penicillin G subcutaneously - 30,000 IU/lb.
Treatment No 5:[a]	TYLAN 200 - 10 mg/lb.

[a]Some of the antimicrobial drugs used in this study were used for extra-label purpose or at extra-label dosages and require a veterinarian-client-patient relationship before use.

[d]Primor®, Hoffman-LaRoche, Inc., Nutley, NJ 07110.

Results and Discussion

Effects of PH vaccine on weight gains, sick days, morbidity, and mortality are shown in Table 4. Average daily gains during the 28 day receiving period were not affected by the administration of PH vaccine. The number of sick days per head was reduced (P>.05) 18.5% in the vaccinated cattle (2.2 vs 2.7 days/head). Morbidity was reduced (P<.10) from 40.4% to 33.1% with PH vaccine (18.1% reduction) and death loss was lower (P<.10) in the PH vaccinated group.

Effects of PH vaccine on the health and performance of the sick cattle are shown in Table 5. Those sick cattle vaccinated with PH vaccine tended to gain slightly faster than those not vaccinated (.64 vs .55 lb/head/day). The number of sick days per head and and the number of repulls tended to be greater in the vaccinated cattle than the nonvaccinated cattle (6.4 vs 6.2 days/head and 16.9 vs 14.4%). Trial two was the only trial in which PH vaccine appeared to increase repulls. The response of sick cattle to first drug treatment was greater in the vaccinated cattle (65.1 vs 52.9%). None of these differences proved significant.

The data were also analyzed with those sick cattle pulled at time of processing excluded from the model (33 control head and 30 PH head) since it would take approximately 24 hours for the vaccine to have an affect on the cattle (Perino, 1985). Effects of PH vaccine on weight gains, sick days, morbidity, and mortality with these head excluded are presented in Table 6. The number of sick pen days per head was

Table 4. Effect of PH vaccine on daily gains, sick days, morbidity and mortality in stressed cattle.

	Controls	PH Vaccine
Number of head	256	248
Number of head never sick	152	165
Arrival weight, lb	530	528
Average daily gain, lb*	.92	.99
Daily gain of head never sick, lb*	1.21	1.23
Sick days*	2.7[b]	2.2[a]
Morbidity, %*	40.4[b]	33.1[a]
Mortality, %	1.2[b]	0.0[a]

*Expressed as least square means.
[a,b]Means with different superscripts differ (P<.10).

Table 5. Effect of PH vaccine on daily gains, sick days, repulls and response to first treatment in sick cattle.

	Controls	PH Vaccine
Number of head	104	83
Average daily gain, lb*	.55	.64
Sick days*	6.2	6.4
Repulls, %*	14.4	16.9
Response to first treatment, %	52.9	65.1

*Expressed as least square means.

Table 6. Effect of PH vaccine on daily gains, sick days, morbidity and mortality in stressed cattle with sick head pulled at processing excluded.

	Controls	PH Vaccine
Number of head	223	218
Arrival weight, lb	515	537
Average daily gain, lb*	.99	1.14
Sick days*	2.1[b]	1.5[a]
Morbidity, %*	32.5[d]	25.1[c]
Mortality, %	.45	0.0

*Expressed as least square means.
[a,b]Means with different superscripts differ (P<.05).
[c,d]Means with different superscripts differ (P<.10).

significantly reduced (P<.05) by 28.6% in the PH vaccinated cattle as compared to the nonvaccinated cattle (1.5 vs 2.1 days). This reduction is greater than was observed with all cattle in the model. Morbidity was 22.8% lower in the PH vaccinated cattle than in the nonvaccinated cattle (25.1 vs 32.5%).

Effects of PH vaccine on the health and performance of the sick cattle with those head pulled at processing excluded are reported in Table 7. The results were quite similar to those observed with all sick head left in the model. The number of repulls for both vaccinated and nonvaccinated cattle was much lower with the data analyzed this way (8.6% for controls and 9.4% for PH cattle). It would appear that most of the cattle requiring retreatment for sickness were originally pulled at processing.

Under the conditions of this study, health and performance of newly arrived cattle tended to be improved by treatment with live Pasteurella hemolytica vaccine. Vaccinated cattle experienced less sickness and required fewer treatments for BRD than nonvaccinated cattle. Smith (1983) in a trial with newly arrived feedlot calves noted greater benefits with PH vaccination (morbidity and treatment days reduced 44 and 40%, respectively) than were observed in this study. These data suggest that PH vaccine can improve the health of stressed cattle.

Table 7. Effect of PH vaccine on daily gains, sick days, repulls and response to first treatment in sick cattle with head pulled at processing excluded.

	Controls	PH Vaccine
Number of head	71	53
Average daily gain, lb*	.46	.55
Sick days*	5.9	5.9
Repulls, %*	8.6	9.4
Response to first treatment, %	52.6	68.3

*Expressed as least square means.

Literature Cited

Frank, G.H. and P.C. Smith. 1983. Prevalence of Pasteurella haemolytica in transported calves. Am. J. Vet. Res. 44:981.

Martin, S.W. et al. 1980. Factors associated with mortality in feedlot cattle: The Bruce County beef cattle project. Can. J. Comp. Med. 44:1.

Perino, L.J. 1985. Personal communication. Okla. State Univ.

Purdy, C.W. et al. 1983. A profile of lightweight feeder calves vaccinated with modified live Pasteurella hemolytica. In: R.W. Loan (Ed.). Bovine Respiratory Disease, A Symposium. Texas A & M Univ. Press, p. 464 (Abstr.).

Smith, C.K. 1983. The use of a live Pasteurella hemolytica vaccine to prevent bovine respiratory disease. In: R.W. Loan (Ed.). Bovine Respiratory Disease, A Symposium. Texas A & M Univ. Press, p. 470 (Abstr.).

Wilkie, B.N. 1980. Principles of biological control of shipping fever. Proc. 13th Annual Am. Assoc. Bovine Pract., p. 113.