THE EFFECT OF INTERFERON ON HEALTH AND PERFORMANCE OF NEWLY ARRIVED STOCKER CATTLE

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Story in Brief

Three hundred thirty-two newly received steer and bull calves and yearlings averaging 491 pounds were divided into two groups. One hundred seventeen head received routine processing upon arrival and 215 head received routine processing plus intranasal administration of recombinant leukocyte hybrid A/D interferon. Administration of interferon reduced morbidity by 20.6% (39.7% for interferon cattle vs 50.0% for controls). Sick days were reduced by 33.3% with interferon treatment (3.2 vs 4.8 days/hd) and repulls were decreased by 39.5% (11.8 vs 19.5%). Cattle treated with interferon tended to gain faster (11.7%) than control cattle (1.72 vs 1.54 lb/head/day), consumed less feed and had 16.3% higher gain to feed ratios (.107 vs .092 lb gain/lb feed).

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

Introduction

Interferon is a small protein produced or released by animal cells in response to invasion by viral or certain nonviral stimuli which indirectly protects other cells against viral damage by stimulating the production of new antiviral polypeptide or protein (Rosenquist, 1973). Interferon is believed to play an important role in the recovery of host animals from viral infections (Baron et al., 1966) which is independent of the body's specific immune mechanisms (Rosenquist and Loan, 1969).

Viruses of almost every major viral group have been shown to induce and be affected by interferon though some are more efficient stimulators of interferon production or are more sensitive to its actions than others (Rosenquist, 1973). Those viruses most commonly associated with the Bovine Respiratory Disease (BRD) complex that have been shown to induce interferon production are infectious bovine rhinotracheitis (IBR) and parainfluenza-3. Interferon has been shown to protect against heterologous respiratory tract viral infections (Cummins and Rosenquist, 1982). Cummins and Hutcheson (1983) reported that calves orally administered with interferon once daily on the day of and for two days subsequent to IBR virus inoculation gained faster than control calves and calves receiving interferon intravenously or intranasally.

The objective of this research was to study the effect of intranasal administration of recombinant leukocyte hybrid A/D interferon (INF) on the health and performance of newly arrived stocker cattle.

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Materials and Methods

Four truck loads (trials) of cattle were purchased by order buyers from auction markets in Alabama, Kentucky, Texas, and Oklahoma and shipped to Pawhuska, Oklahoma. The arrival 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 as unloaded, ear tagged and treated with Lysoff®[a]. Following weighing and tagging cattle were placed in pens of 20 to 25 animals each depending on the number of cattle received. Cattle were randomly assigned by pen to one of the following two treatments: controls (received no interferon) or intranasal administration of recombinant leukocyte hybrid A/D interferon at one million units per kg of body weight. 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 in interferon treatment groups received intranasal administration of interferon.
4. Cattle with odd-numbered ear tags were dewormed with ivermectin[b] (200 µg/kg) and those cattle with even-numbered ear tags served as controls as part of a deworming trial superimposed on this study.
5. Cattle were started on antibiotic treatment if clinical signs of illness were detected or if body temperature exceeded 104°F except for one-third of the cattle which received no treatment if they became sick.
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 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.

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[a]	Arrival Wt., lb	% Shrink
1	AL	10-12-84	98	477	6.9
2	KY	11-14-84	91	506	5.0
3	TX	12-20-84	93	475	6.9
4	OK & TX	2-15-85	87	497	7.4

[a]19 and 18 head from trials 1 and 2, respectively, used in other experiments (not interferon).

[a]Cutter Laboratories, Shawnee Mission, KS 66201.
[b]Ivomec®, MSD Agvet, Rahway, NJ 07065.

Table 2. Composition of feed supplement.

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

[a]International Feed Number.
[b]To provide: 0 for control, 75 mg lasalocid/lb.

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.

Medical treatment for sick animals was determined by the ear tag number which was applied at random on arrival. Treatment schedules were (A) no treatment (negative controls), (B) a sequence of antimicrobial drugs listed in Table 3, or (C) an experimental potentiated sulfa (RO5-0037[c]) substituted for Treatment 1 in Table 3. Cattle treated by schedules B and C 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 C received

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.

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

R05-0037 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, as necessary, cattle were castrated and horns were tipped. Cattle were then returned to the owner.

Results and Discussion

Effects of interferon on weight gains, sick days, morbidity, and mortality across all cattle are presented in Table 4. Average daily gains during the 28 day receiving period were 1.72 lb/day for cattle treated with INF and 1.54 lb/day for the control cattle. The average number of sick pen days per head was significantly decreased ($P<.01$) with INF treatment from 4.8 to 3.2 days. Morbidity was high in both groups, but was lower ($P<.05$) in the INF group (39.7 vs 50.0%). Death loss was decreased in the INF treated group (3.1 vs 4.6%; $P>.05$). The death loss percentage among cattle that were treated when they became ill by treatment schedule B or C was 1.6% in the control cattle and 0% in the cattle treated with INF.

Average daily gains of the cattle that were never sick were 2.20 and 1.98 lb/hd/day for control cattle and cattle treated with INF, respectively. Apparently the increased gains observed in all cattle treated with INF were due to reduced sickness. It appears that interferon does not increase weight gains of cattle that never become sick.

Effects of interferon on the health and performance of the sick cattle are reported in Table 5. Daily gains of the sick cattle were increased by 32.7% with INF administration (1.34 vs 1.01 lb/hd). The number of treatment days per sick head tended to be lower in the INF treated group (9.1 vs 9.7 days) and the number of repulls also tended to be lower in this group (11.8 vs 19.5%). Cattle treated with INF tended

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

	Controls	Interferon
Number of head	117	215
Number of head never sick	59	126
Arrival weight, lb	491	488
Average daily gain, lb*	1.54	1.72
Daily gain of head never sick, lb*	2.20	1.98
Sick days*	4.8[b]	3.2[a]
Morbidity, %*	50.0[d]	39.7[c]
Total Mortality, %*	47.6	3.1
Mortality excluding treatment schedule A cattle, %*	1.6[f]	0[e]

*Expressed as least square means.
[a,b]Means with different superscripts differ ($P<.01$).
[c,d]Means with different superscripts differ ($P<.05$).
[e,f]Means with different superscripts differ ($P<.10$).

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

	Controls	Interferon
Number of head	58	89
Average daily gain, lb*	1.01	1.32
Sick days*	9.7	9.1
Repulls, %*	19.5	11.8
Response to first treatment, %*	43.5	49.3

*Expressed as least square means.

to responded more favorably to first drug treatment (49.3 vs 43.5%). None of these differences were significant.

Feed intakes and gain to feed ratios are presented in Table 6. Interferon treatment reduced feed intake ($P<.05$) from 17.45 to 16.21 lb per head per day. This 7.1% reduction in feed intake combined with the 11.7% increase in daily gains with INF treatment resulted in an improvement ($P<.05$) in gain to feed ratio of 16.3% (.107 vs .092 lb gain/lb feed).

Interferon should begin affecting the animal's non-immune defenses approximately 24 hours after administration (Fulton, 1985). Hence, the data also was analyzed with those cattle pulled as sick at processing excluded from the model (15 control head and 19 INF head) since INF could not have affected the initial sickness in these cattle. Effects of interferon on weight gains, sick days, morbidity, and mortality with these head excluded are summarized in Table 7. Average daily gains tended to be higher in the INF treated group (1.74 vs 1.63 lb/day). Cattle treated with INF had fewer sick days ($P<.01$, 2.5 vs 4.0 days/head) and lower morbidity (35.4 vs 43.8%). Mortality was higher in the cattle treated with INF (3.1 vs 2.4%).

Effects of interferon on the health and performance of sick cattle with those head pulled at processing excluded are presented in Table 8. Cattle treated with INF tended to have higher weight gains (1.36 vs 1.08 lb/head/day), fewer sick days (8.4 vs 9.3 days/hd), and fewer repulls (12.3 vs 21.9%) than control cattle. Response to first drug treatment was also higher in the INF treated group (56.4 vs 51.7%). None of these differences were significant.

Under the conditions of this study health and performance of newly arrived cattle tended to be improved by treatment with intranasal recombinant leukocyte hybrid A/D interferon. Interferon holds promise

Table 6. Effect of interferon on feed intake and gain to feed ratio.

	Controls	Interferon
Number of pens	6	11
Feed intake, lb*	17.45^{b}	16.21^{a}
lb gain/lb feed*	$.092^{a}$	$.107^{b}$

*Expressed as least square means.
a,bMeans with different superscripts differ, ($P<.05$).

Table 7. Effect of interferon on daily gains, sick days, morbidity and mortality in stressed cattle with sick head pulled at processing excluded.

	Controls	Interferon
Number of head	102	194
Arrival weight, lb	491	491
Average daily gain, lb*	1.63	1.74
Sick days*	4.0[b]	2.5[a]
Morbidity, %*	43.8	35.4
Total Mortality, %*	2.4	3.1
Mortality excluding treatment schedule A cattle, %*	1.0	0

*Expressed as least square means.
[a,b]Means with different superscripts differ (P<.01).

Table 8. Effect of interferon on daily gains, sick days, repulls and response to first treatment in sick cattle with head pulled at processing excluded.

	Controls	Interferon
Number of head	43	68
Average daily gain, lb*	1.08	1.36
Sick days*	9.3	8.4
Repulls, %*	21.9	12.3
Response to first treatment, %*	51.7	56.4

*Expressed as least square means.

as a means of reducing sickness and improving health in stressed stocker cattle. However, further studies need to be conducted with INF before definite conclusions concerning its effects and economics can be made.

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