

# A Three Year Comparison of Acute Respiratory Disease, Shrink and Weight Gain in Preconditioned and Non-preconditioned Illinois Beef Calves Sold at the Same Auction and Mixed in a Feedlot

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## ABSTRACT

During 1969 to 1971, 78 preconditioned (PC) and 79 non-preconditioned (NPC) beef calves were purchased at the same auction and mixed in a feedlot. Preconditioned calves were weaned 30 days before the sale, used to drinking from a tank, and vaccinated against blackleg, malignant edema, infectious bovine rhinotracheitis (IBR), parainfluenza-3 (PI3) and bovine virus diarrhea (BVD) in 1970 and 1971, and *Pasteurella hemolytica* and *multocida* in 1971. All vaccinations were completed two to three weeks before the sale. PC calves were given thiabendazole. PC calves had significantly less shrink after shipment and in 1971 significantly more rapid daily gain during the first weeks of the feeding period. In 1969 more PC calves were treated for acute respiratory disease than NPC calves during an outbreak of PI3 and BVD infection. In 1970 and 1971 fewer PC than NPC calves were treated for acute respiratory tract disease during outbreaks of PI3 infection. The differences in clinical respiratory disease were significant in 1971. Inclusion of two doses of *P. hemolytica* and *P. multocida* bacterin before the sale in 1971 and use of an intranasal PI3 vaccine was considered to improve the PC program. Fecal egg counts for gastrointestinal nematodes were much lower in PC calves treated with thiabendazole than untreated NPC calves.

## RÉSUMÉ

Entre 1969 et 1971, on acheta, au même endroit de vente aux enchères, un total de 78 veaux de boucherie impliqués dans un programme de conditionnement, et de 79 qui ne l'étaient pas; on les réunit ensuite dans le même parc d'engraissement. On avait sevré les premiers, 30 jours avant l'encan, on les avait habitués à boire dans un bassin et on les avait vaccinés contre le charbon symptomatique, l'oedème malin, la rhino-trachéite infectieuse bovine (RIB), le para-influenza-3 (PI3) et la diarrhée à virus bovine (DVB), en 1970 et 1971, ainsi qu'avec une bactérine contenant *Pasteurella hemolytica* et *multocida*, en 1971. On compléta toutes les vaccinations, de deux à trois semaines avant la vente. On administra aussi du thiabendazole aux veaux impliqués dans le programme de conditionnement. La perte de poids de ces derniers s'avéra minime après le transport et, en 1971, ils accusèrent un gain de poids plus rapide durant les premières semaines après leur arrivée au parc d'engraissement. En 1969, au cours d'une attaque de PI3 et de DVB, on traita plus de cas de maladies respiratoires aiguës chez les veaux conditionnés que chez les autres. En 1970 et 1971, au cours d'attaques de PI3, le contraire se produisit. Les différences relatives au nombre de cas de maladies respiratoires cliniques s'avèrent appréciables en 1971. L'incorporation de deux injections d'une bactérine contenant *P. hemolytica* et *multocida*, avant la vente aux enchères de 1971, ainsi que l'administration intranasale d'un vaccin contre le PI3, semble améliorer le programme de conditionnement. Le nombre d'oeufs de parasites gastro-intestinaux s'avéra beaucoup moins élevé dans le fumier des veaux conditionnés ayant reçu du thiabendazole que dans celui des non conditionnés auxquels on n'avait pas administré cet anthelminthique.

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## INTRODUCTION

The sale of native beef calves in Illinois through cooperative feeder calf sales has provided a useful marketing system for many years. A survey of six sales in the fall of 1966 indicated that 29% of 4,451 calves and yearlings were affected with respiratory disease after shipment (14). In 1968, a preconditioning trial at one of the Illinois sales demonstrated that morbidity and mortality after shipment was reduced in the preconditioned cattle (12). The following report gives the results of a three year study comparing preconditioned (PC) and non-preconditioned (NPC) calves sold at the same auction, mixed in the same feedlot, and evaluated for shrink, clinical respiratory disease, and weight gains after shipment.

## MATERIALS AND METHODS

Previous recommendations for preconditioning calves served as guides (1, 2). The requirements for the preconditioned calves follow. Three to four weeks before the sale in the fall of 1969 and 1970, recommendations were that calves be weaned and acclimated to grain if they were not on creep feed. In addition, they should be accustomed to drinking from a tank. For several years, the sale had required that dehorning and castration be performed well in advance of the sale. In 1969, all calves received malignant edema and blackleg bacterin,<sup>1</sup> IBR-PI3 vaccine,<sup>1</sup> and were wormed with thiabendazole boluses according to body weight at least three weeks prior to sale date. In 1970, similar IBR-PI3 combination vaccine<sup>1</sup> plus bovine virus diarrhea vaccine<sup>1</sup> was used three weeks or more in advance of the sale. In 1971 intranasal PI3 vaccine was used in combination with IBR-BVD vaccine<sup>1</sup>. In addition, two doses of a combined bacterin of *Clostridium chauvei-septicum* and *Pasteu-*

*rella hemolytica* and *multocida* were given two to three weeks apart. Preconditioned calves were tagged by the veterinarian in the right ear with the green certified preconditioned for health (CPH) tag recommended by the American Association of Bovine Practitioners.<sup>2</sup> Non-preconditioned calves served as controls. NPC calves were separated from their dams and shipped directly to the sales barn.

PC and NPC calves were shipped by truck from Shelbyville, Illinois, to the Dixon Springs Agricultural Center, Veterinary Medicine Research feedlot, a distance of about 150 miles. The sales were held at night and the calves were shipped to arrive at the feedlot about 8 a.m. the next day. Each calf was weighed soon after arrival, and blood samples collected to determine antibody titers to infectious bovine rhinotracheitis (IBR), parainfluenza-3 (PI3), and bovine virus diarrhea (BVD). Nasal secretions were obtained from each calf for examination for viral, bacterial and mycoplasmal agents. For virus isolation, nasal swabs were placed in tryptose and frozen at -40°C. The procedures for tissue culture, microbial and serological examinations have been described (4, 7, 8, 9, 10). Fecal samples were obtained and examined as reported earlier (6).

Access to baled or stacked hay was provided, and grain and protein supplement was fed daily. Calves were weighed 30 to 50 days after shipment and blood samples and nasal secretions were collected for examination as described above. Weights were determined by using a Ranger portable scale. Calves were observed daily for any evidence of acute respiratory disease. Clinically affected calves were restrained in a chute, nasal secretions obtained for examination for microbial agents, and a blood sample collected for determination of antibody levels to viral respiratory agents. Clinical cases were treated until apparent recovery. Clinical cases were temperatured daily until rectal temperatures remained within the normal range as recorded by an electronic thermometer.

Initial therapy for early cases of acute respiratory tract disease showing depression, nasal and lacrimal discharge, elevated rectal temperature above 104°F and increased respiratory rate consisted of intravenous or intraperitoneal injection of sul-

<sup>1</sup>In 1969 Rhivax P-modified live IBR-PI3 vaccine, Pitman-Moore Co., Indianapolis, Ind. was used. In 1970 Reaplex-modified live IBR-PI3 virus, Ft. Dodge Lab., Ft. Dodge, Iowa, and BVD vaccine, modified live virus, Jensen-Salsbury Laboratories, Kansas City, Mo., was used. In 1971 electrogen CSP bacterin, Nasalgen P-modified live bovine myxovirus parainfluenza for intranasal use was given plus IBR-BVD vaccine-Modified live virus — all from Jensen-Salsbury Laboratories, Kansas City, Mo.

<sup>2</sup>National Band and Tag Co., Newport, Ky.

fonamides<sup>3</sup> in conjunction with oral dosage for sustained effect.<sup>4</sup> In refractory cases tetracyclines<sup>5</sup> were then used, followed by corticosteroids<sup>6</sup> in some instances. Protracted cases requiring further treatment were given parenteral injections of penicillin-streptomycin,<sup>7</sup> iomycin,<sup>8</sup> or tylosin<sup>9</sup> until recovery.

## RESULTS

Total weight loss after shipment was 4.4% in PC calves compared to 5.7% in NPC calves. This advantage was consistent in PC calves and was statistically significant when calculated by the chi square method ( $P = < .01$ ). Weight gains were higher in the PC calves during the period of observation. The 1971 gains during the first weeks after shipment were greatest in PC calves and the difference was statistically significant ( $P = < .01$ ). Clinical cases of acute respiratory tract disease were treated in all groups during the three-year study. In 1969 more cases were treated in the PC than NPC calves. It is noteworthy that the NPC calves not treated in 1969 were those that had BVD antibody titers at the time they entered the feedlot. In 1970 and 1971 fewer cases of respiratory disease were treated in the PC calves. The difference was statistically significant ( $P = < .01$ ).

<sup>3</sup>Sulfamethazine, sulfathiazole, sulfapyridine. Norden Laboratories, Lincoln, Nebraska.

<sup>4</sup>Sulfamethazine spanbolet. Norden Laboratories, Lincoln, Nebraska.

<sup>5</sup>Oxytetracycline hydrochloride injectable, 50 mg/cc. Dept. of Vet. Med., Pfizer, Inc., New York, N.Y.

<sup>6</sup>Azium (dexamethasone). Schering Corporation, Bloomfield, N.J.

<sup>7</sup>Distrycillin, Procaine Penicillin G in Dehydrostreptomycin Sulfate Solution. E. R. Squibb & Sons, Inc., New Brunswick, N.J.

<sup>8</sup>Iomycin, combination of diethylaminoethyl ester penicillin G hydriodide and dihydrostreptomycin. Norden Lab., Lincoln, Nebraska.

<sup>9</sup>Tylan 200, tylosin for injection. Elanco Products Co. Div. of Eli Lilly and Co., Indianapolis, Ind.

TABLE I. Weight Loss After Shipment, Deaths, and Number of Calves Treated for Acute Respiratory Disease in Preconditioned and Non-preconditioned Lots

Year	Preconditioned						Not Preconditioned					
	No Calves	% Shrink	No Treated	%	No Died	%	No Calves	% Shrink	No Treated	%	No Died	%
1969	27	5.4	25	91.0	1	3.7	32	6.0	26	84	0	—
1970	27	4.7	16	59.0	0	—	30	5.9	18	60	0	—
1971	24	3.0	8	33.0	0	—	17	5.1	13	76.5	0	—
Totals	78	4.4	49	63.0	1	1.3	79	5.7	57	73.0	0	—

TABLE II. Comparison of Cost<sup>a</sup> of Treatment for Acute Respiratory Disease After Shipment of Preconditioned and Non-preconditioned Beef Calves

Year	Preconditioned					Non-preconditioned					Cost of Total Treatment per Calf
	No Calves	No Treated	% Treated	Total Cost	Cost per Calf	No Calves	No Treated	% Treated	Total Cost		
1969	27	25	91.0	\$208.00 <sup>d</sup>	\$7.99	32	26	84.0	\$228.00 <sup>e</sup>	\$7.12	
1970	27	16	59.0	60.00 <sup>f</sup>	2.22	30	18	60.0	70.00 <sup>g</sup>	2.32	
1971	24	8	33.0	69.00 <sup>b</sup>	2.85	17	13	76.5	193.00 <sup>h</sup>	11.35	
	78	49	63.0	\$327.00	\$6.67 Avg	79	57	73.0	\$481.00	\$8.44 Avg	

<sup>a</sup>Does not include services of the veterinarian

<sup>b</sup>36 separate treatments

<sup>c</sup>123 separate treatments

<sup>d</sup>346 separate treatments

<sup>e</sup>336 separate treatments

<sup>f</sup>91 separate treatments

<sup>g</sup>101 separate treatments

TABLE III. Comparison of Weight Gains During Early Feeding Period in Preconditioned and Non-preconditioned Calves

Date Started	Preconditioned					Not Preconditioned					
	Weight	Date Terminated	Weight	Total Weight Gain	Avg Daily Gain lbs/day	Date Started	Weight	Date Terminated	Weight	Total Weight Gain	Avg Daily Gain lbs/day
10-24-69	11,081	12-18-69	13,340	2,259	1.9 <sup>a</sup>	10-24-69	13,009	12-18-69	16,001	2,992	1.2 <sup>a</sup>
10-23-70	11,439	3-08-71	16,475	5,036	1.2 <sup>b</sup>	10-23-70	12,410	3-08-71	17,775	5,365	1.1 <sup>b</sup>
10-29-71	9,533	12-8-71	11,294	1,761	1.8 <sup>c</sup>	10-29-71	7,228	12-08-71	7,933	705	1.0 <sup>c</sup>
Totals	32,053		41,109	9,056	1.63		32,647		41,709	9,062	1.1

<sup>a</sup>46 days  
<sup>b</sup>130 days  
<sup>c</sup>41 days

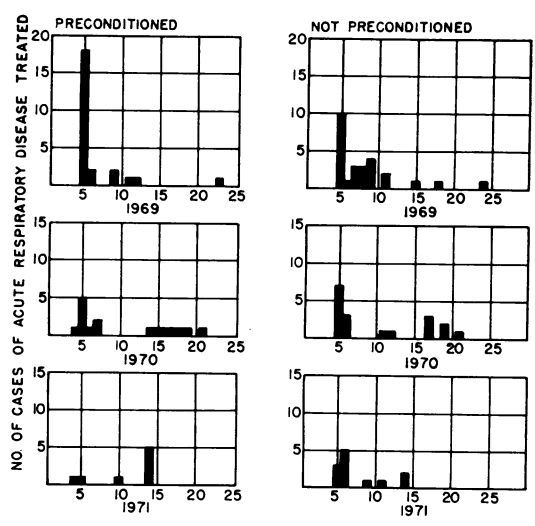


Fig. 1. Incubation period after shipment to time of first treatment for acute respiratory disease in preconditioned and non-preconditioned calves.

in 1971. The results on weight loss after shipment, clinical cases of respiratory disease treated, cost of treatment, and weight gains after shipment are summarized in Tables I, II, and III.

The incubation periods of clinical respiratory disease after shipment in PC and NPC calves showed some differences. In 1969 clinical cases peaked earlier in the PC calves. During 1970 a trend toward two epidemic curves was noted in both groups with a five to seven day interval between clusters of new cases treated. The 1971 outbreak showed that most cases in PC calves were treated two weeks after shipment, whereas more cases in the NPC calves were treated within five to six days after shipment. The incubation periods are given in Fig. 1.

BACTERIOLOGICAL FINDINGS

*Pasteurella hemolytica* and *P. multocida* were isolated from nasal secretions of both PC and NPC calves immediately after shipment in 1969 and 1971. These agents were isolated at the time of shipment more frequently in 1971; however, no increase at the time of the second sampling several weeks after shipment was found except in 1971 when an increase in *P. multocida* was noted in both PC and NPC calves.

*Mycoplasma* sp were isolated more frequently than *Pasteurella* sp except during 1971. In 1969 these agents were isolated from more calves after clinical disease than

TABLE IV. *Pasteurella* sp and *Mycoplasma* sp in Nasal Secretions of Preconditioned and Non-preconditioned Calves on Entrance to Feedlot and After All Clinical Illness Had Subsided

Date	Preconditioned					Non-preconditioned				
	No Calves	No Sampled	<i>Pasteurella multocida</i>	<i>Pasteurella hemolytica</i>	<i>Mycoplasma</i> sp	No Calves	No Sampled	<i>Pasteurella multocida</i>	<i>Pasteurella hemolytica</i>	<i>Mycoplasma</i> sp
10-24-69	27	26	4	2	9	32	22	1	3	15
12-18-69	26	25	4	0	13	32	32	2	0	19
10-23-70	27	27	0	0	15	30	30	0	0	4
11-19-70	27	27	not done	not done	not done	30	30	not done	not done	not done
10-29-71	24	24	2	5	4	17	17	1	2	0
12-08-71	24	24	5	2	4	17	17	7	1	2

at the time the calves entered the feedlot. The results of attempts to isolate *Pasteurella* sp and *Mycoplasma* sp are summarized in Table IV. Use of the latex agglutination test on convalescent sera in 1969 showed 41% positive (1:40 dilution or above) in both groups. No pathogenic bacteria or mycoplasma were isolated from the PC calf that died in 1969. Histological examination revealed hepatitis and bronchopneumonia.

#### VIRUS ISOLATION

Two isolations of bovine myxovirus parainfluenza-3 were made from PC calves in 1969. No other cytopathic agents were isolated.

#### SEROLOGICAL TESTS FOR VIRAL AGENTS

Testing of paired sera during the observation showed that in 1969 BVD and PI3 infection occurred in both groups. NPC calves had higher titers against IBR at entrance into the feedlot than did the PC calves. However, the titer decreased at the time of the second testing. HI titers to PI3 virus were low or absent in both groups of calves at the time of shipment.

In 1970 the PC calves showed titers twice or more as high to IBR, BVD, and PI3 at the time of shipment than did the NPC calves. Titers to IBR increased slightly and to PI3 markedly in the PC calves. SN titers to BVD persisted longer at a detectable level in the NPC calves. The antibody titers were appreciably higher against the three viruses at the time of shipment in the 1970 PC calves compared with the 1969 PC calves.

Serological tests in 1971 revealed significant titers to IBR and PI3 in PC calves at the time of shipment. In the NPC calves no detectable titers were evident for IBR and were low for PI3. Titers against BVD were absent in both groups in acute and convalescent sera. HI titers to PI3 virus increased markedly between sampling periods to a higher level in the NPC than PC calves. The serological test results for detection of antibodies to IBR, BVD, and PI3 are summarized in Table V.

#### PARASITOLOGICAL EXAMINATION OF FECAL SAMPLES

Egg counts for gastrointestinal nematodes ranged from zero in 1971 to a mean of 103 in 1970 in the PC calves at the time the feedlot study started. The three year mean

egg count for the PC calves was 54, compared to 805 for the NPC calves. Mean counts for the NPC calves during the three year period ranged from 240 in 1969 to 205 in 1970. These results are summarized in Table VI.

## DISCUSSION

The three year controlled feedlot study of PC and NPC calves purchased at the same auction agrees closely with the results from field observations during the same period (15). In no year was all acute respiratory disease prevented but the decreases noted in 1970 and especially 1971 are noteworthy. This difference, however, was statistically significant in 1971. The devastating effect of combined PI3-BVD viruses in conjunction with *Pasteurella* sp and mycoplasma was very evident in the 1969 observation. During 1970 and 1971, PI3-virus infection seemed most important. The clinical reduction in disease during the 1971 studies favors use of the intranasal PI3 vaccination approach as a preventive (5), as well as two doses of *Pasteurella* bacterin that contain *P. hemolytica* and *multocida*.

The intramuscular PI3 vaccine used in 1970 had previously been used with good success, however (13).

The impact of passive immunity on the vaccines used in 1969 and 1970 is not known. IBR infection did not appear to be a significant factor in this study since no increases in titer were detected in NPC calves. However, considering the reported field cases of IBR in Illinois and titers in NPC calves in 1969, preventive vaccination against IBR should be included in any PC program used for Illinois feeder calves.

The microbiological results — especially at the second sampling — were undoubtedly affected by the vigorous treatment regimen of clinical cases of acute respiratory disease. *Pasteurella multocida* increased in both PC and NPC calves in 1971 and PC calves yielded more *P. hemolytica* than NPC calves at the time of entrance to the feedlot. Early treatment undoubtedly prevented relapses and lung abscessation that commonly occurs in cattle with mixed respiratory infections. In addition, this type of approach of early and thorough treatment would undoubtedly help decrease the serious loss from condemnation and trimming of carcasses at slaughter due to pleurisy and pneumonia (3).

The consistency of significantly less

TABLE V. Geometric Mean Serological Titers for IBR, BDV and PI3 in Preconditioned and Non-preconditioned Calves at Indicated Times

Date	Preconditioned					Not Preconditioned				
	No	No Tested	IBR	BVD	PI3	No	No Tested	IBR	BVD	PI3
10-24-69	27	27	1.8	1.2	0	32	29	4.0	1.6	0
12-18-69	26	25	1.3	11.4	10.7	32	32	1.1	11.5	11.0
10-23-70	27	27	3.3	7.2	3.2	30	30	1.1	4.4	1.3
11-19-70	27	27	4.1	0	6.4	30	30	1.1	2.0	1.4
10-29-71	24	24	5.2	0	13	17	17	0	0	1.2
12-08-71	24	24	5.4	0	84	17	17	0	0	95.5

TABLE VI. Gastrointestinal Nematode Eggs Per Gram of Feces in Preconditioned and Non-preconditioned Calves at Start of Study

Year	Preconditioned		Non-preconditioned	
	No Calves Sampled	Eggs per Gram of Feces	No Calves Sampled	Eggs per Gram of Feces
1969	21	59	31	240
1970	26	103	26	1205
1971	24	0	17	970
	71	Avg 54	74	Avg 805

shrink in PC calves compared to NPC calves, together with significant increase in gain early in the feeding period in 1971, is very encouraging. This may be an indication of better adaptation to stress during and after shipment. The PC program is designed to help reduce losses during one change of ownership. Undoubtedly, resale of PC calves from one sale to another would erode much of the value of a PC program as described in this report.

The use of thiabendazole for elimination and reduction of gastrointestinal nematodes seemed effective. Due to the high egg counts in NPC calves, additional controlled studies should be done to evaluate their impact as a stressor and possible detriment to rate of gain and feed efficiency (11). The combined effect of reduction of clinical respiratory disease and shrink, together with increased rate of gain early in the feeding period in PC calves, should give encouragement to preconditioning in bovine preventive medicine.

Additional study is needed, however, in preventing acute respiratory tract disease in calves sold through auction markets. The morbidity in the calves in the three year study described in this report seems excessively high. Future improvement in PC programs may reduce clinical disease further. Prophylactic or preventive measures to combat pathogens not yet identified may be developed or methods of effectively increasing nonspecific resistance in beef calves after weaning might be applied.

Present use should be made of improved management practices together with active immunization against known pathogens before calves are mixed in auction markets. Direct sale from farms of origin to the feedlot would possibly prevent much of the clinical respiratory disease described in this report. However, marketing feeder calves at auctions will undoubtedly continue to be used for some time.

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