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Impacts of a Post-Transport/Pre-Processing Rest Period on the Growth Performance and Serum Metabolites of Cattle Entering a Feedlot

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K-STATE Research and Extension

CATTLEMEN'S DAY 2022

KANSAS STATE UNIVERSITY CATTLEMEN'S DAY

Impacts of a Post-Transport/Pre-Processing Rest Period on the Growth Performance and Serum Metabolites of Cattle Entering a Feedlot

P.L. Dahmer, Z.T. Buessing, N.B. Stafford, M.E. Reeb, C.A. Zumbaugh, A.J. Tarpoff, K.G. Odde, J.S. Drouillard, M. Theurer, T. Jones, and C.K. Jones

Abstract

A total of 80 crossbred, high-risk heifers [initial body weight (BW) = 551 ± 9.3 lb] were transported from an Oklahoma City, OK, sale barn to the Kansas State University Beef Cattle Research Center. Upon arrival, heifers were placed into one of four pens in a completely randomized design. Each pen of heifers was then randomly assigned to one of four rest times before processing: 1) immediately upon arrival (0); 2) after a 6-hour rest period (6); 3) after a 24-hour rest period (24); and 4) after a 48-hour period (48). Heifers were weighed individually on days 0, 7, 14, 21, 28, and 35 to calculate average daily gain (ADG). Feed added and refusals were measured daily to determine dry matter intake (DMI). Blood samples were analyzed for infectious bovine rhinotracheitis (IBR) titer and serum chemistry. Processing time did not impact ($P > 0.05$) heifer BW or ADG. Overall, DMI decreased linearly ($P = 0.027$) as rest time increased. The number of days for heifers to reach a targeted DMI of 2.5% BW was linearly increased ($P = 0.023$) as rest time increased. Serum IBR titer for heifers processed at either 0 or 6 hours upon arrival was higher ($P < 0.01$) on day 35 compared to day 0. In summary, rest time prior to processing did not impact receiving calf growth performance; however, a 6-hour rest period upon arrival appeared to be most beneficial to DMI.

Introduction

Stress from transportation and processing is unavoidable in the beef industry; however, management of cattle upon receiving to a feedlot plays an integral role in their health and performance thereafter. Appropriately vaccinating, deworming, and treatment with antibiotics is part of a successful receiving protocol. Additionally, rest time during long transport of cattle has been studied, but data are variable regarding its benefits to animal stress levels and performance upon receiving (Melendez et al., 2021; Cooke et al., 2013; Marti et al., 2017). Delaying processing upon arrival to a feedlot is an area of interest to counteract the stress associated with transport. A general rule of thumb is that cattle should receive one hour of rest for every hour they were transported; however, few studies have evaluated different rest times under controlled conditions. Thus, our objectives were to evaluate the impact a post-transport rest period had on calf growth

performance. Additionally, we also aimed to determine any effects on calf blood serum metabolites as indicators of immune function.

Experimental Procedures

A total of 80 crossbred heifers [initial body weight (BW) = 551 ± 9.4 lb] were transported from an Oklahoma City, OK, sale barn to the Kansas State University Beef Cattle Research Center. Heifers were considered high-risk and originated from a geographic area high in parasites. Upon arrival, heifers were unloaded and placed into one of four receiving pens. Each pen of heifers (n = 20) was then randomly assigned to one of four treatments of varying rest times before processing: 1) immediately upon arrival (0); 2) after a 6-hour rest period (6); 3) after a 24-hour rest period (24); and 4) after a 48-hour period (48). At processing, all heifers were tagged, weighed, and subcutaneously injected with moxidectin and orally dosed with oxfendazole. Heifers were also subcutaneously injected with tulathromycin, a recombinant *Mannheimia haemolytica* leukotoxoid vaccine, and a modified-live virus vaccine containing infectious bovine rhinotracheitis (IBR), bovine viral diarrhea (types 1 and 2), bovine respiratory syncytial virus, and parainfluenza 3. After processing, cattle were returned to their receiving pen until all cattle had been processed at 48-hour after arrival to the facility. Heifers were then placed into individual pens, each containing an automatic waterer and feed bunk to provide *ad libitum* access to feed and water. Heifers were weighed individually on days 0, 7, 14, 21, 28, and 35 to calculate average daily gain (ADG). Feed was individually weighed and delivered to each heifer daily, with refusals collected and weighed daily to determine dry matter intake (DMI). On days 0 and 35, blood samples were collected via the coccygeal vein from each heifer and submitted to the Kansas State University Veterinary Diagnostic Laboratory for analysis of IBR titer and serum chemistries. All data were analyzed as a completely randomized design using the GLIMMIX procedure of SAS (v. 9.4, SAS Inst., Cary, NC) with individual animal as the experimental unit. The statistical model included the random effects of 'barn' and 'location within barn'. For blood metabolite data, the model included the main effects of treatment and sampling day, as well as their interaction. Results were considered significant if $P < 0.05$ and marginally significant if $0.05 < P < 0.10$.

Results and Discussion

Growth performance data are presented in Table 1. Processing time did not impact ($P > 0.05$) heifer ADG. Overall, DMI decreased linearly ($P = 0.027$) as the rest time increased. The number of days for heifers to reach a targeted DMI of 2.5% BW was linearly increased ($P = 0.023$) as time of rest increased. The main effect of rest time impacted ($P = 0.038$) the percentage of heifers that reached a DMI of 2.5% BW by day 14 of the experiment, where 25.0, 60.0, 52.6, and 23.5% of cattle reached this parameter after 0, 6, 24, and 48 hours of rest prior to processing, respectively. While morbidity did not differ between treatments ($P > 0.10$), mortality increased linearly ($P = 0.026$) as the time of rest increased.

Serum metabolite data are presented in Table 2. While a significant processing time × day interaction was observed for nearly all parameters ($P < 0.05$), only a few differences were biologically significant. Serum IBR titer for heifers processed at either 0 or 6 hours upon arrival was significantly higher ($P < 0.01$) on day 35 compared to day 0. This response was expected, as these cattle were vaccinated immediately or shortly after arrival. Interestingly, no difference in IBR titer was observed ($P > 0.05$) between day 0

and day 35 for heifers processed at either 24 or 48 hours upon arrival, indicating that these cattle may have been exposed to virus during transport or the rest period and had time to seroconvert antibodies to the virus before vaccination.

Implications

These results indicate that rest time after arrival and prior to processing may not affect calf growth performance, but there is evidence that a 6-hour rest period could maximize DMI upon arrival to a feedlot. Additional research with greater replication and more industry-standard experimental conditions should be conducted to further evaluate these parameters.

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Table 1. Impact of time of processing on feedlot heifer growth performance, mortality, and morbidity[1]

	Processing time after arrival, hour[2]					*P* =		
Item	0	6	24	48	SEM[3]	Treatment	Linear	Quadratic
Weight, lb								
Day 0	551	556	542	556	3.70	0.858	0.980	0.473
Day 14	593	595	586	597	3.02	0.949	0.896	0.654
Day 35	664	675	661	668	2.91	0.902	0.992	0.835
ADG,[4] lb/day								
Days 0 to 14	2.9	2.9	3.3	2.9	0.33	0.879	0.750	0.493
Days 14 to 35	3.3	3.7	3.5	3.3	0.33	0.624	0.693	0.509
Days 0 to 35	3.3	3.3	3.3	3.3	0.18	0.678	0.945	0.311
DMI,[5] lb/day								
Days 0 to 14	11.5[ab]	11.9[a]	11.2[ab]	10.8[b]	1.4	0.031	0.012	0.635
Days 14 to 35	19.8	20.7	19.2	18.7	3.1	0.150	0.072	0.937
Days 0 to 35	16.3	17.2	15.4	15.4	2.1	0.057	0.027	0.956
DMI, % of BW[6]								
Days 0 to 14	2.11	2.16	2.09	1.93	0.15	0.091	0.020	0.344
Days 14 to 35	3.37	3.50	3.29	3.15	0.28	0.239	0.075	0.782
Days 0 to 35	2.98	3.10	2.97	2.80	0.22	0.183	0.061	0.426
Gain:feed								
Days 0 to 14	0.25	0.24	0.29	0.26	0.030	0.645	0.507	0.368
Days 14 to 35	0.17	0.18	0.18	0.18	0.015	0.891	0.626	0.936
Days 0 to 35	0.20	0.20	0.21	0.21	0.010	0.703	0.375	0.471
Days to 2.5% BW DMI	18[ab]	15[b]	18[ab]	20[a]	1.3	0.030	0.023	0.393
Prevalence, %								
Mortality	0.0	0.0	0.0	10.5	3.57	0.096	0.026	0.236
Morbidity	0.0	0.0	5.3	0.0	2.60	0.382	0.806	0.113
Cattle to 2.5% BW by day 14	25.0	60.0	52.6	23.5	11.56	0.038	0.354	0.025

[ab]Means within a row that do not share a common superscript differ $P < 0.05$.

[1]A total of 80 mixed-breed, high-risk heifers were used in a 35-day experiment with one heifer per pen and 20 replicates per treatment.

[2]Cattle were processed at either 0, 6, 24, or 48 hours after their arrival to the research facility.

[3]SEM = standard error of the mean.

[4]ADG = average daily gain.

[5]DMI = dry matter intake.

[6]BW = body weight.

Table 2. Impact of processing time after arrival on IBR titer and serum biochemical parameters[1]

	Processing time after arrival, hour[2]					Treatment
Blood parameter	**0**	**6**	**24**	**48**	**SEM**	**× day, *P* =**
IBR titer, 1:X[3]					15.2	0.0006
Day 0	8^{b}	1^{b}	54^{ab}	54^{ab}		
Day 35	64^{a}	70^{a}	47^{ab}	31^{ab}		
Glucose, mg/dL					7.3	0.0002
Day 0	82^{bc}	76^{bc}	68^{c}	108^{a}		
Day 35	83^{bc}	85^{abc}	83^{abc}	96^{ab}		
Urea nitrogen, mg/dL					0.9	< 0.0001
Day 0	12^{b}	18^{a}	16^{a}	17^{a}		
Day 35	9^{b}	10^{b}	10^{b}	9^{b}		
Creatinine, mg/dL					0.10	0.0008
Day 0	1.2^{ab}	1.2^{ab}	1.2^{ab}	1.3^{a}		
Day 35	0.9^{b}	0.9^{b}	1.0^{b}	1.1^{ab}		
Total protein, g/dL					0.15	< 0.0001
Day 0	7.4^{a}	7.4^{a}	7.3^{ab}	7.3^{ab}		
Day 35	6.7^{c}	6.7^{c}	6.8^{bc}	6.8^{bc}		
Globulin, g/dL					0.15	< 0.0001
Day 0	4.1^{a}	4.1^{a}	4.0^{ab}	3.9^{abc}		
Day 35	3.4^{cd}	3.4^{d}	3.6^{bcd}	3.6^{bcd}		
Bicarbonate, mmol/L					1.1	0.0008
Day 0	19^{b}	22^{ab}	22^{ab}	18^{b}		
Day 35	22^{ab}	23^{a}	23^{a}	22^{ab}		
Anion gap, mmol/L					1.2	< 0.0001
Day 0	29^{bc}	27^{c}	32^{b}	37^{a}		
Day 35	30^{bc}	29^{bc}	30^{bc}	30^{bc}		
Sodium:potassium ratio					0.7	< 0.0001
Day 0	26^{a}	26^{a}	23^{b}	25^{ab}		
Day 35	26^{a}	27^{a}	26^{a}	26^{ab}		
Alkaline phosphatase, U/L					17.5	< 0.0001
Day 0	112^{c}	120^{c}	142^{bc}	119^{c}		
Day 35	208^{a}	204^{ab}	199^{ab}	201^{ab}		
Sorbitol dehydrogenase, U/L					2.18	< 0.0001
Day 0	6.5^{b}	10.2^{b}	3.6^{b}	4.5^{b}		
Day 35	20.9^{a}	18.7^{a}	18.2^{a}	19.5^{a}		

$^{a\text{-}c}$Means within the same row that do not share a common superscript differ, $P < 0.05$.

[1]A total of 80 mixed-breed, high-risk heifers were used in a 35-day experiment with one heifer per pen and 20 replicates per treatment.

[2]Cattle were processed at either 0, 6, 24, or 48 hours after their arrival to the research facility.

[3]Serum samples were analyzed for infectious bovine rhinotracheitis (IBR) titer via serum neutralization antibody test with the means displayed as the ratio of serum:dilutant where no antibodies remained detectable within the sample.