

CATTLEMEN'S DAY 2022

BEEF CATTLE RESEARCH

SUMMARY PUBLICATION



CATTLEMEN'S DAY 2022



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Effects of Late-Summer Prescribed Fire on Botanical Composition, Soil Cover, and Forage Production in Caucasian Bluestem-Infested Rangeland in the Kansas Smoky Hills: Year 3 of 4

Micke Ramirez

Objective: The objective was to document the effects of late-summer prescribed fire on soil cover, botanical composition, and forage production in the Kansas Smoky Hills and associated effects on dense Caucasian bluestem (*Bothriochloa bladhii*) stands therein.

Study Description: The study took place on a private ranch in Ellsworth County, in the Kansas Smoky Hills. Eighteen one-acre plots were assigned randomly to one of two prescribed-fire treatments: no burn (control) and burn (burned August 14, 2019). Soil cover, plant composition, and forage production were evaluated annually. These data represent plant community effects prior to treatment and one and two years subsequent to treatment.

Effects of late-summer prescribed fire on native-mixed grass prairie in the Kansas Smoky Hills

Item	Year post-treatment						SEM ¹	P-value
	Pre-treatment		Year 1		Year 2			
	No burn	Burn	No burn	Burn	No burn	Burn		
Caucasian bluestem, % basal cover	31.7 ^{abc}	32.8 ^{bc}	30.0 ^{ab}	20.3 ^a	36.7 ^a	24.0 ^c	7.91	<0.01
Grass species richness, number	7.8 ^a	7.6 ^a	7.3 ^a	9.4 ^b	7.3 ^a	9.0 ^b	0.57	<0.01
Forb species richness, number	13.3 ^{ab}	11.4 ^{ac}	9.7 ^c	15.1 ^b	9.8 ^c	10.4 ^c	1.59	<0.01
Forage biomass, lb/acre*	2616	2229	3162	1978	3580	2859	208.9	0.30

¹Standard error of the mean.

^{ac} Within rows, means with unlike superscripts differ ($P < 0.01$).

*Treatment main effect $P < 0.01$.

The Bottom Line: These data were interpreted to indicate that one application of late-summer prescribed fire was associated with decreased presence of Caucasian bluestem and intermittent increases in native grass and forb richness, a component of biological diversity. Some declines in forage production were noted.

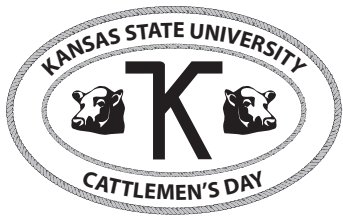


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Effects of Prescribed Fire Timing on Stocker Cattle Performance and Native Plant Composition: Year 3 of 6

Zachary Duncan

Objective: The objective of this experiment was to document the effects of prescribed-fire timing on stocker cattle performance, soil cover, and plant species composition over a six-year period.

Study Description: Yearling stocker cattle were assigned to one of three prescribed-burn treatments: spring (April 9 ± 5.1 days), summer (August 23 ± 4.9 days), or fall (September 29 ± 8.7 days). Calves were grazed from May to August for 90 days. Individual body weights (BW) were recorded at the beginning and end of the grazing season to determine total BW gains and average daily gains. Native plant composition and soil cover were evaluated annually using a modified step-point method.

Effects of prescribed-fire timing on stocker cattle performance and basal cover in the Kansas Flint Hills: Year 3 of 6

Item	Prescribed-fire season			SEM ¹	P-value
	Spring	Summer	Fall		
Initial BW, ² lb	658	662	653	8.6	0.56
Final BW, lb	896 ^a	894 ^a	872 ^b	8.9	0.03
Total BWG, ³ lb	237 ^a	230 ^{ab}	219 ^b	5.9	0.02
ADG, ⁴ lb/day	2.64 ^a	2.56 ^{ab}	2.44 ^b	0.065	0.02
Basal cover, % of total basal vegetation cover					
Total grass cover	89	90	85	2.7	0.22
Total forb cover	10.2	8.9	13.2	2.65	0.29

¹Standard error of the mean.

²Body weight.

³Body weight gain.

⁴Average daily gain.

^{ab}Within rows, means with unlike superscripts differ ($P \leq 0.05$).

The Bottom Line: We interpreted these data to suggest that summer-season prescribed-fire could be used to manage sericea lespedeza (*Lespedeza cuneata*) infestations without reducing grazing performance of yearling cattle or damaging the vigor of native warm-season plant populations.

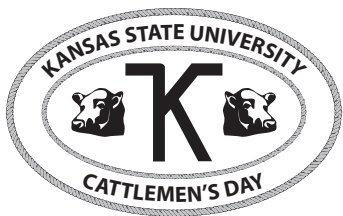


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Inclusion of Biuret With or Without Bovatec in a Commercial Mineral Supplement Did Not Improve Growth Performance of Yearling Calves Grazing Native Grass: Year 1 of 2

Madison Pflughoef

Objective: The objective of this experiment was to measure the effects of non-protein nitrogen (NPN; biuret) or NPN + ruminal modifier (biuret + Bovatec, Zoetis, Parsippany, NJ) inclusion in a commercial mineral mix on growth performance of yearling beef calves grazing in the Kansas Flint Hills.

Study Description: Three hundred ninety-five crossbred steers (initial body weight: 612 ± 77.8 lb) of Texas origin previously backgrounded at the Kansas State University Beef Stocker Unit were used. Three mineral treatments consisting of a basal supplement (control), a basal supplement plus NPN (biuret), and a basal supplement plus NPN and lasalocid (Bovatec) were provided with a 4 oz/head/day mineral consumption target. The three mineral treatments were randomly assigned to one of 18 pastures with a total of six pastures per treatment. Feeders were checked daily to determine days-to-empty and were weighed weekly to determine mineral consumption. Individual weights were collected at the start and end of the 90 days to determine initial and final body weights (BW).

Results: There was no difference ($P \geq 0.31$) in final BW, total BW gains, average daily gains, and mineral consumption between mineral treatments. For days-to-empty, there was an interaction between treatment and week of the experiment ($P = 0.02$).

Effects of inclusion of biuret and Bovatec on stocker cattle performance in the Kansas Flint Hills

Item	Mineral treatments			SEM ¹	P-value
	Control	Biuret	Biuret + Bovatec		
Initial BW, ² lb	610	613	623	11.1	0.48
Final BW, lb	816	829	830	11.1	0.40
Total BWG, ³ lb	206	216	206	7.8	0.32
ADG, ⁴ lb/day	2.29	2.41	2.29	0.090	0.32
Daily mineral intake, oz/head	3.96	3.96	3.85	0.081	0.31

¹Standard error of the mean.

²Body weight.

³Body weight gain.

⁴Average daily gain.

The bottom line: The data were interpreted to suggest that the addition of biuret or biuret and lasalocid to a commercial mineral supplement did not affect growth performance of yearling beef cattle grazing in the Kansas Flint Hills.

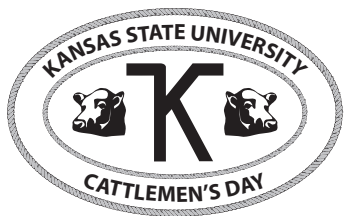


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Evaluation of Differing Genetic Potentials on Beef Cattle Resource Use in the Great Plains

Andrew Lakamp

Objective: The objective of this study was to examine the environmental impact and efficiencies of beef cattle with differing genetic potentials in the Great Plains.

Study Description: A 100-head cow-calf herd was simulated for 74 different land regions and six combinations of genetic potential within regions: large, moderate, or small mature size and high (24.2 lb/day) or low (17.6 lb/day) milk production. The simulation determined the average amount of feed required to maintain the herd. Land, water, and methane production were estimated for each combination of land use area and genetic potential. Weaning weight was estimated for each genetic potential to find resource use efficiency.

Average annual environmental impact per pound of weaning weight (WW) of a 100 head cow-calf herd with differing genetic potentials in the Great Plains

Genetic potential ¹	Grazing land	Crop land	Total land	Drinking water	Irrigation water	Total water	Methane
	----- ac/lb WW -----			----- 1000 gal/lb WW -----			lb/lb WW
Large weight							
High milk	0.0252	0.0022	0.0275	0.0066	0.1192	0.1258	0.3013
Low milk	0.0269	0.0022	0.0291	0.0068	0.1165	0.1233	0.3117
Moderate weight							
High milk	0.0237	0.0022	0.0259	0.0065	0.1175	0.124	0.2939
Low milk	0.0253	0.0022	0.0275	0.0067	0.1145	0.1212	0.3017
Small weight							
High milk	0.0221	0.0022	0.0243	0.0064	0.1155	0.1219	0.2851
Low milk	0.0237	0.0021	0.0258	0.0066	0.1127	0.1193	0.2917

¹Weight (large, moderate, and small) was parameterized for each herd using data from regional surveys of cattle producers. Low lactation potential was designated 17.6 lb milk/day at peak lactation; high lactation potential was 24.2 lb milk/day at peak lactation.

The Bottom Line: Animals with greater energy requirements have larger environmental footprints. However, in environments where nutritional availability is not restricted, small, high milking cattle likely have the smallest environmental footprint per pound of weaned calf.

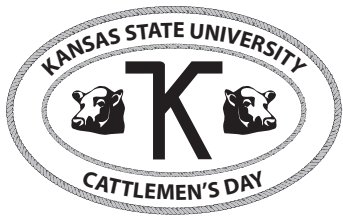


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Bunk Space Requirements for Growing Beef Cattle Limit-Fed a High-Energy Corn and Corn Co-Product Diet

Zachary Duncan

Objective: The objective of our experiment was to evaluate the effects of bunk allotment on performance of growing beef calves during a 58-day receiving period, and investigate possible residual effects of bunk-space allotment on subsequent growth performance during a 90-day grazing season.

Study Description: A group of 385 crossbred steers (initial weight 473 ± 56 lb) were purchased in Texas and transported to the Kansas State University Beef Stocker Unit. Calves were blocked by arrival date, assigned to one of four bunk space treatments (i.e., 10, 15, 20, or 25 in of bunk per head), and limit-fed a high-energy corn and corn co-product diet for 58 days. Following the receiving period, steers were blocked by bunk-space treatment, randomly assigned to one of eighteen pastures, and grazed for 90 days.

Effects of bunk-space allotment during a 58-day receiving period on overall performance of growing calves following a 90-day grazing season

Item	Treatment, in				SEM ¹	P-value		
	10	15	20	25		Lin	Quad	Cubic
Final body weight, lb	823	829	825	822	10.3	0.80	0.53	0.73
Total weight gain, lb	351	353	351	345	7.1	0.33	0.37	0.98
ADG, ² lb/day	2.12	2.13	2.12	2.07	0.043	0.29	0.36	0.96

¹Standard error of the mean.

²Average daily gain.

The Bottom Line: We interpreted our data to suggest that bunk allotments of 10, 15, 20, or 25 in per calf had minimal impact on growth performance during a 58-day receiving period and did not affect final body weights following a 90-day grazing season.

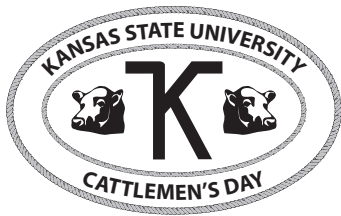


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Feed Efficiency is Better and Activity is Greater in Growing Cattle Limit-Fed a High-Energy Diet During the Growing Phase Compared to a Traditional Roughage-Based Diet Fed for *Ad Libitum* Intake

Morgan Scilacci

Objective: The objective of this experiment was to compare performance impacts of a high-energy diet limit-fed at 2.2% of body weight (BW) daily on a dry matter (DM) basis to a traditional roughage-based diet fed for *ad libitum* intake during the growing phase.

Study Description: Three hundred seventy crossbred heifers (initial BW = 496 ± 44 lb) were used in a receiving and growing study at the Kansas State University Beef Stocker Unit in the spring of 2020. Animals were fed once daily at 7:00 a.m. Bunks were visually observed, and feed refused was estimated. *Ad libitum* feed refusal was targeted at 20 lb. A pen scale was used to measure weekly pen BW, adjust feed offerings, and to calculate pen performance.

Table 2. Performance of newly received growing cattle limit-fed a high-energy versus a traditional roughage-based growing diet

Item	Diet ¹		SE ²	P-value
	45AL	60LF2.2		
Number of pens	8	8		
Number of animals	186	184		
BW, lb				
Day 0	500.9	503.8	2.65	0.43
Treatment end	757.7	721.6	5.91	< 0.01
ADG, ³ lb/day	2.93	2.49	0.07	< 0.01
Gain to feed ratio, lb/lb	0.139	0.188	0.01	< 0.01
Rumination, minutes/day	455.7	302.8	12.01	< 0.01
Activity, minutes/day	346.2	369.5	3.12	< 0.01

¹45AL = 45 Mcal of net energy for gain (NE_g) per 100 lb of DM offered for *ad libitum* DMI. 60LF2.2 = 60 Mcal of NE_g per 100 lb of DM limit-fed at 2.2% of BW on a DM basis.

²Standard error.

³Average daily gain.

The Bottom Line: Growing heifers limit-fed a high-energy diet at 2.2% of BW daily on a DM basis had 35% better feed efficiency and were more active by 23 minutes per day, on average, than heifers full-fed a traditional roughage-based diet.

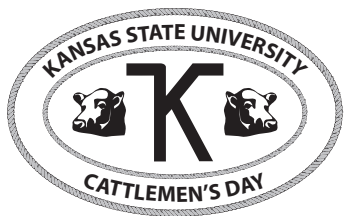


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A Limit-Fed, High-Energy Diet Fed During the Growing Phase Does Not Negatively Affect Subsequent Feedlot Growth Performance or Carcass Merit Compared to Feeding a Traditional Roughage-Based Diet *Ad Libitum* During the Growing Phase

Morgan Scilacci

Objective: The objective of this experiment was to compare the subsequent growth performance and carcass impacts of a high-energy diet limit-fed at 2.2% of body weight (BW) or a traditional roughage-based diet fed *ad libitum* during the growing phase.

Study Description: Three hundred seventy crossbred heifers (initial BW = 496 ± 44 lb) previously used in a 90-day growing study at the Kansas State University Beef Stocker Unit were transported to a commercial feedlot (Pratt Feeders, Pratt, KS) for finishing where cattle were fed a common diet. The two backgrounding diets included: (1) 45 Mcal of net energy for gain (NEg) per 100 lb of dry matter (DM) fed for *ad libitum* intake (45AL), or (2) 60 Mcal NEg per 100 lb of DM limit-fed at 2.2% of BW daily on a DM basis (60LF2.2). Both diets contained 40% of DM as Sweet Bran (Cargill Animal Nutrition, Blair, NE). Cattle were sorted by weight group (light or heavy) and backgrounding diet (45AL or 60LF2.2) and placed in one of four pens. Finishing growth performance and carcass characteristics were measured.

Results: Heifers previously fed 60LF2.2 had greater morbidity ($P < 0.01$) than heifers fed 45AL. No effect ($P \geq 0.52$) of backgrounding diet was observed in measured carcass characteristics.

Finishing performance of cattle previously limit-fed a high-energy or traditional roughage-based diet within finishing sort group

Item	Sort group				SEM ²	P-value ³		
	Heavy		Light			S	B	S × B
	Backgrounding diet ¹							
	45AL	60LF2.2	45AL	60LF2.2				
Number of pens	1	1	1	1				
Number of animals	94	91	92	92				
Ending weight, lb	1329.6	1326.5	1328.3	1312.6	14.1	0.51	0.53	0.59
ADG, ⁴ lb/day	3.33	3.37	2.93	2.89	0.07	< 0.01	0.90	0.43
Morbidity, %	5.3	16.0	10.4	30.6	4.5	0.01	< 0.01	0.19

¹45AL = 45 Mcal of net energy for gain (NEg) per 100 lb of dry matter (DM) fed for *ad libitum* intake. 60LF2.2 = 60 Mcal NEg per 100 lb of DM limit-fed at 2.2% of BW daily on a DM basis.

²Largest standard error of the mean is reported.

³S = sort group; B = backgrounding diet; S × B = sort group × backgrounding diet interaction.

⁴Average daily gain.

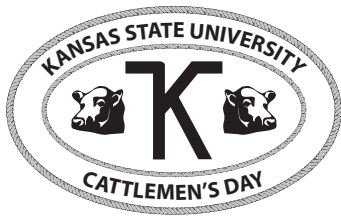


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The Bottom Line: Although heifers previously limit-fed a high-energy diet during the growing phase appeared to have greater incidence of morbidity in the feedlot compared to heifers previously fed a traditional roughage-based diet, previous backgrounding diet had little or no carryover effect on feedlot growth performance or carcass characteristics measured.

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Digestibility of Dry Matter is Better and Manure Output is Lower in Growing Cattle Limit-Fed a High- Energy Diet During the Growing Phase Compared to a Traditional Roughage-Based Diet Fed for *Ad Libitum* Intake

Morgan Scilacci

Objective: Evaluate the impact on intake and digestion of a high-energy diet limit-fed at 85% of the *ad libitum* daily consumption of a roughage-based diet on a dry matter (DM) basis compared to a traditional roughage-based growing diet in growing cattle.

Study Description: Eight ruminally cannulated crossbred Angus heifers (body weight = 450 ± 24 lb) were used in a cross-over design with two consecutive 15-day periods at the Kansas State University Beef Stocker Unit. Two dietary treatments were fed: (1) 45 Mcal of net energy for gain (NE_g) per 100 lb of DM fed for *ad libitum* DM intake (45AL), or (2) 60 Mcal NE_g per 100 lb of DM limit-fed at 85% of 45AL diet intake on a DM basis (60LF85%). Both diets contained 40% of DM as Sweet Bran (Cargill Animal Nutrition, Blair, NE). Heifers were fed once daily at 10:00 a.m. Each 15-day period included 10 days for diet adaptation, 4 days for fecal sampling, and 1 day for ruminal sampling. Daily nutrient intake was measured and apparent total-tract diet digestibility using chromic oxide (Cr₂O₃) marker was determined.

Results: Ruminal pH was greater ($P < 0.01$) from 10:00 p.m. to 10:00 a.m. just before feeding for heifers fed 60LF85% than 45AL heifers. Diet digestibility was improved by 5.2% ($P < 0.01$) and fecal DM output 35% lower ($P < 0.01$) in heifers fed 60LF85% than heifers fed 45AL.

Nutrient intake, diet digestibility, and fecal DM output of growing heifers

Item	Diet ¹		SEM ²	P-value
	45AL	60LF85%		
Number of observations	8	8		
DM intake, lb/day	17.77	13.73	0.82	< 0.01
Apparent total tract DM digestibility, %	74.8	78.7	0.77	0.01
Fecal DM output, lb/day	4.52	2.92	0.24	< 0.01

¹45AL = 45 Mcal of net energy for gain (NE_g) per 100 lb of dry matter (DM) fed for *ad libitum* DM intake daily; 60LF85% = 60 Mcal NE_g per 100 lb of DM limit-fed at 85% of 45AL diet intake on a DM basis.

²Standard error of the mean.

The Bottom Line: Heifers limit-fed a high-energy diet based on corn and Sweet Bran had greater ruminal pH during the overnight hours, better diet digestibility, and reduced output of manure than heifers full-fed a traditional roughage-based diet.

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Syngenta Enogen Corn Fed as Corn Grain and Corn Silage in Diets Containing Corn Coproducts Did Not Enhance Growth Performance of Growing Heifers

Morgan Scilacci

Objective: Evaluate the effect of feeding corn grain and corn silage from Syngenta Enogen corn hybrids (EC; Syngenta Seeds, LLC., Downers Grove, IL) or conventional corn hybrids in diets containing either wet distillers grain (WDG; ICM Biofuels, St. Joseph, MO) or Sweet Bran (WCGF; Cargill Animal Nutrition, Blair, NE) on growth performance in growing cattle.

Study Description: Three hundred eighty-four crossbred heifers [initial body weight (BW) = 582 ± 42 lb] were used in a completely randomized design, 81-day receiving and growing study, with a 2 × 2 factorial arrangement of four dietary treatments. Experimental diets were formulated to contain 30% WDG or 30% WCGF on a dry matter (DM) basis and provide 51 megacalories of net energy for gain per 100 lb of DM daily. Diets were fed *ad libitum* once daily.

Table 1. Enogen corn hybrids or conventional hybrids in diets containing corn coproducts on growth performance of growing cattle

Item	Corn source ¹				SE ³	P-value ⁴		
	CON		EC			S	CP	S × CP
	WCGF	WDG	WCGF	WDG				
Number of pens	8	8	8	8				
Number of animals	96	96	96	96				
BW, lb								
Day 0	549.0	551.4	548.7	546.7	1.94	0.21	0.95	0.26
Day 81	798.1	815.0	806.2	813.9	5.71	0.49	0.03	0.48
ADG, ⁵ lb/day	3.06	3.26	3.17	3.31	0.07	0.25	0.03	0.72
Gain to feed ratio, lb/lb	0.154	0.162	0.157	0.161	0.01	0.78	0.12	0.68
Fecal starch, % of total DM	15.2	17.1	13.5	11.4	1.35	0.02	0.91	0.15

¹ CON = Conventional corn, dry rolled. EC = Enogen corn, dry rolled (Syngenta Seeds, LLC, Downers Grove, IL). The diets were formulated to contain 51 Mcal of NE_g per 100 lb of DM daily.

² WCGF = wet corn gluten feed (Sweet Bran, Cargill Animal Nutrition, Blair, NE). WDG = wet distillers grain (ICM Biofuels, St. Joseph, MO).

³ Standard error.

⁴ S = corn source. CP = coproduct.

⁵ ADG = Average daily gain.

The Bottom Line: Our results revealed no effect of replacing conventional corn grain and silage with Enogen corn grain and silage on the growth performance of growing cattle, but diets containing WDG resulted in a better gain to feed ratio and average daily gain in growing heifers compared to diets containing WCGF.



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Syngenta Enogen Corn Fed as Corn Grain and Corn Silage in Diets Containing Corn Coproducts Did Not Enhance Diet Digestibility in Growing Heifers

Morgan Scilacci

Objective: Evaluate the effect of feeding corn grain and corn silage from Enogen corn (EC; Syngenta Seeds, LLC., Downers Grove, IL) or conventional corn (CON) in diets containing either wet distillers grain (WDG; ICM Biofuels, St. Joseph, MO) or Sweet Bran [proprietary wet corn gluten feed (WCGF); Cargill Animal Nutrition, Blair, NE] on intake and digestibility in growing cattle.

Study Description: Eight ruminally cannulated crossbred heifers (initial body weight = 816 ± 94 lb) were used in an intake and digestibility study designed as a replicated 4×4 Latin square. Four consecutive, 15-day periods consisted of 10 days for diet adaptation, 4 days of fecal sampling, and 1 day of ruminal sampling. Heifers were fed once daily at 10:00 a.m. Chromic oxide (Cr_2O_3) was used as an external digestion marker to calculate apparent total-tract diet digestibility.

Results: Heifers eating EC tended to have greater starch digestibility ($P = 0.07$) than heifers eating CON. No differences ($P > 0.34$) in dry matter or fiber digestibilities were observed between corn sources. There were coproduct \times hour interactions for concentration of ruminal ammonia ($P < 0.01$) and two branched chain fatty acids, isobutyrate ($P < 0.01$) and isovalerate ($P < 0.01$). In heifers fed WCGF, isobutyrate and isovalerate concentrations reached a peak at 2 hours after feeding, then declined between 2 and 24 hours after feeding. Heifers fed WDG isobutyrate and isovalerate concentrations were greatest at 0 hours after feeding. Differences between concentrations of isobutyrate and isovalerate can be explained by differences in protein digestibility of WCGF and WDG.

The Bottom Line: Enogen corn hybrids fed as dry rolled corn and corn silage in diets containing corn coproducts did not result in better diet digestibility compared to conventional corn hybrids, but diets containing WDG may offer better growth performance (Scilacci et al., 2022) for growing cattle due to more ruminally undegradable protein compared to diets containing WCGF.

Reference: Scilacci, M.A., M.A. Johnson, E.C. Titgemeyer, S.P. Montgomery, A.J. Tarpoff, E.D. Watson, W.R. Hollenbeck, D.A. Blasi. 2022. "Syngenta Enogen Corn Fed as Corn Grain and Corn Silage in Diets Containing Corn Coproducts Did Not Enhance Growth Performance of Growing Heifers," *Kansas Agricultural Experiment Station Research Reports*: Vol. 8, Issue 1.

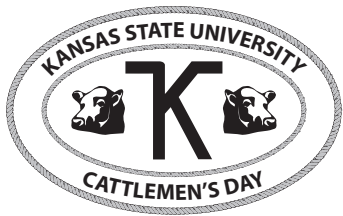


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Impacts of a Post-Transport/Pre-Processing Rest Period on the Growth Performance and Serum Metabolites of Cattle Entering a Feedlot

Payton Dahmer

Objective: The objective of this study was to evaluate the impact of a post-transport rest period on receiving calf growth performance and blood serum metabolites as indicators of immune function.

Study Description: Eighty heifers were purchased from a sale barn and transported 6 hours to the Kansas State University Beef Cattle Research Center where they were processed at one of four times: immediately upon arrival or after a 6-, 24-, or 48-hour rest period. Cattle were then fed for 35 days with growth performance data collected weekly. Blood samples were also collected and analyzed for serum infectious bovine rhinotracheitis (IBR) titer and biochemical parameters.

Results: Processing time did not impact ($P > 0.05$) heifer average daily gain. Overall, dry matter intake (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% body weight was linearly increased ($P = 0.023$) as time of rest 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. 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 potential seroconversion of IBR antibodies before vaccination.

The Bottom Line: 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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Effect of Holstein and Beef-Dairy Cross Breed Description on the Sale Price of Feeder and Weaned Calf Lots Sold Through Video Auctions

Esther McCabe

Objective: Objectives were to determine: 1) value of Holstein feeder steer lots compared with steer lots of other breed descriptions, 2) value of beef-dairy cross weaned steer calves compared with either Holstein weaned calves or weaned calves of other breed descriptions, and 3) value of beef-dairy cross weaned calves compared with weaned calves of other beef breed descriptions sold through video auctions.

Study Description: Data on 14,075 feeder steer lots sold in 211 auctions from 2010 through 2018; 763 weaned steer calf lots, and 1,125 weaned steer and heifer calf lots sold via seven auctions in 2020 and 2021 were used. Separate multiple regression models using backwards selection were developed for feeder cattle, weaned steer, and weaned steer and heifer calf lots. The five breed group categories used were English-English crossed, English-Continental crossed, Brahman-influenced, Holstein, and beef-dairy crossed (weaned calves).

Results: Breed description of feeder steer, weaned steer calf, and weaned steer and heifer calf lots affected sale price ($P < 0.0001$). Among weaned steer calves, beef-dairy crossed lots sold for the second lowest ($P < 0.05$) price (\$147.62/cwt), though greater than Holsteins. Among feeder steer lots, Holsteins sold for the lowest ($P < 0.05$) sale price (\$110.56/cwt) compared with all other breed groups. Among weaned steer and heifer calves, beef-dairy crosses sold for less than ($P < 0.05$; \$136.39/cwt) all other breed groups.

Effect of breed description on the sale price of weaned steer calf lots sold through seven Superior Livestock Auction video sales in 2020 and 2021

Breed description	Number of lots	Least squares mean of sale price, \$/cwt	Regression coefficient
English-English cross	270	165.18 ^a	52.14
English-Continental cross	197	160.38 ^b	47.34
Brahman influenced	111	155.54 ^c	42.50
Beef-dairy cross	94	147.62 ^d	34.58
Holstein	91	113.04 ^e	0.00

^{a-e}Means within a factor without a common superscript differ ($P < 0.05$).

The Bottom Line: Beef-dairy crosses have improved value prospect compared with Holstein steers in the beef supply chain.

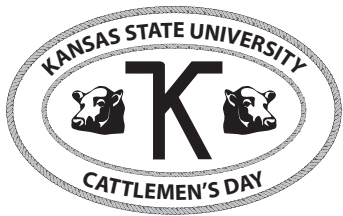


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Challenges Associated with Semen Quality While Collecting Beef Bulls for Semen Freezing

Ashley R. Hartman

Objective: The objective of this study was to evaluate the frequency of failure to freeze semen due to semen quality.

Study Description: Semen collection data from 2008 to 2018 were obtained from the Kansas Artificial Breeding Services Unit and consisted of 14,750 ejaculates from bulls. Bulls were collected twice weekly on Mondays and Thursdays with an artificial vagina. Bulls not receptive to the artificial vagina were subject to electro-ejaculation. A single technician was responsible for all pre-freeze and post-thaw semen analysis. Ejaculates were required to meet quality standards for both progressive motility and morphology.

Results: Over the ten years, 21% of ejaculates met all freezing quality standards, 11% of all ejaculates collected did not have a high enough motility to be considered satisfactory for a breeding soundness exam (BSE), and 63% of all ejaculates did not reach the motility quality threshold for freezing. Ejaculates from bulls ≤ 12 months of age produced ejaculates that would not meet satisfactory levels of a BSE 15% of the time. Ejaculates from bulls 13–18 months of age produced unsatisfactory ejaculates for motility for a BSE 6% of the time. When evaluating primary sperm abnormalities, 87% of ejaculates had less than 20% primary sperm abnormalities. Ejaculates from bulls ≤ 12 months of age produced the highest amount of ejaculates failing due to primary abnormalities with 24%, while bulls ≥ 31 months of age produced the least amount of ejaculates failing due to primary abnormalities at 10% of ejaculates. When evaluating total sperm abnormalities per ejaculate, 77% of ejaculates met the threshold of less than 30% total abnormalities. Ejaculates from bulls ≤ 12 months of age failed to meet the total sperm abnormality threshold 28% of the time. These results highlight one of the main difficulties of collecting freezing quality semen, in which semen meets the standards of normal spermatozoa but where most samples do not meet needs for progressive motility.

The Bottom Line: Of over 14,000 collections, only 21% met all requirements for freezing semen, approximately 63% did not meet progressive motility freezing standards, and 11% did not meet the satisfactory level of a BSE.



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Field Trial Assessing the Use of Sex-Sorted Semen in Beef Cattle

Kolton Aubuchon

Objective: The objective was to evaluate the reproductive performance of sex-sorted semen on beef cows and heifers.

Study Description: For this trial, 320 Angus and SimAngus cows and heifers from four groups were used. Group 1 yearling heifers (n = 101) were synchronized using the melengestrol acetate plus prostaglandin $F_{2\alpha}$ (MGA-PGF $_{2\alpha}$) protocol and Groups 2, 3, and 4 cows (n = 219) were synchronized using the 7-Day CO-Synch + CIDR protocol. Insemination was done with semen from an Angus sire (Group 1 yearling heifers and Group 2 young cows) sorted to contain >90% X-bearing sperm, or a Charolais sire (Groups 3 and 4 mature cows) sorted to contain >90% Y-bearing sperm. Females were bred after visual estrus detection (Group 1 yearling heifers), fixed time artificial insemination (AI; Group 4 mature cows), or split time AI (Group 2 young cows and Group 3 mature cows).

Estrus response, artificial insemination (AI) pregnancy rate, breeding season pregnancy rate, gender accuracy, gender skew, and 200-day adjusted calf weight by group

Group	Estrus response	Breeding season		Gender accuracy ¹	Gender skew ²	200-Day adjusted calf weight ³
		AI pregnancy rate	pregnancy rate			
	----- % -----					lb
Group 1 yearling heifers	95.1	63.4	87.0	94.3	77.7% Heifers	496.6
Group 2 young cows	88.2 ^a	47.1	92.2	89.5	76.1% Heifers	505.6
Group 3 mature cows	75.0 ^b	46.3	92.3	91.0	68.8% Bulls	606.5
Group 4 mature cows	69.3	40.2	90.9	84.8	58.7% Bulls	595.6

¹Gender accuracy is the total number of AI calves of the desired gender divided by the total number of AI calves born.

²Gender skew is the total number of calves born of the desired gender divided by the total number of calves born.

³Average daily gain (ADG) = [fall weight - standard birth weight (80 lb)]/days of age.

Adjusted 200-day weight = (ADG × 200 days) + standard birth weight (80 lb).

^aResponse rate is the number of cows showing estrus by 70 hours plus those showing estrus by 94 hours.

^bResponse rate is the number of cows showing estrus by 70 hours plus those showing estrus by 82 hours.

The Bottom Line: These results indicate that sex-sorted semen has potential in commercial beef cows and heifers. Increasing carcass weights in the beef industry has caused a greater price spread between steers and heifers. With increasing spread in value between heifer calves and steer calves, opportunity exists for economic gain with “bull” sexed semen, especially in terminal sire programs.



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Effects of Betaine on Protein Deposition in Growing Cattle with Modulated Methyl Group Status

Madeline Grant

Objective: This study was conducted to evaluate effects of guanidinoacetic acid and creatine supplementation in the presence or absence of supplemental betaine on lean tissue growth in growing cattle.

Study Description: Seven ruminally cannulated Holstein steers (417 lb) were used in an experiment where each steer received each of six treatments. The first treatment set was conducted via abomasal infusion of a saline solution (control), 15 g/day guanidinoacetic acid (GAA), or 16.8 g/day creatine, and the second set was conducted via abomasal infusion of 0 or 5.6 g/day betaine; all treatment combinations were represented. Complete collection of urine and feces was used to determine nitrogen retention as a measure of protein deposition. Steers were limit-fed a corn-based diet similar to that of a production-type setting.

Table 1. Effects of guanidinoacetic acid, creatine, and betaine on protein deposition in growing cattle

Item	Betaine, g/day						SEM ¹	P-value		
	0			5.6				Betaine	Methyl × methyl	Betaine
	Control	Creatine	GAA	Control	Creatine	GAA				
Number of steers	7	6	7	7	7	6	---	---	---	---
Nitrogen, g/day										
Feed	68.9	69.0	69.4	69.1	68.9	69.0	---	---	---	---
Infused	0.00	5.37	5.37	0.67	6.04	6.03	---	---	---	---
Intake ²	68.9	74.4	74.8	69.8	74.9	75.1	---	---	---	---
Urinary	24.1	26.9	25.9	24.0	25.8	26.0	1.15	0.67	0.08 ³	0.84
Fecal	20.8	25.0	27.2	20.0	23.6	23.8	1.85	0.16	0.01 ³	0.69
Retained	24.1	22.6	21.3	25.7	25.7	25.4	1.99	0.03	0.63	0.71

¹Average standard error of the mean for all treatments.

²Feed nitrogen + infused nitrogen.

³Pairwise means were separated within the methyl group modulator treatment as: control < GAA = creatine; $P \leq 0.05$.

The Bottom Line: Supplementing 5.6 g/day betaine increased lean tissue growth in growing steers fed corn-based diets.

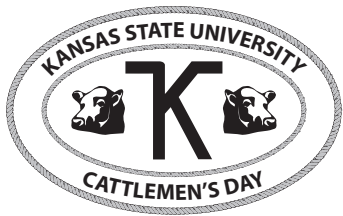


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Effect of Ruminally-Protected Lysine Supplementation to Growing Cattle on Growth and Subsequent Finishing Performance

Katie. J. Hazlewood

Objective: The objective of this study was to evaluate the effects of ruminally-protected lysine supplementation fed during the growing phase to cattle limit-fed a corn-based diet, and to evaluate the subsequent finishing performance.

Study Description: For 77 days, a group of 338 steers limit-fed at 2.4% of body weight daily on a dry matter basis were allocated to treatments providing 0, 3, or 6 g/day of lysine from Smartamine ML (Adisseo, Alpharetta, GA), or containing blood meal plus ruminally-protected methionine from Smartamine M. Growth performance was measured over the growing period. Cattle were then shipped to a commercial feedlot and fed without treatment until slaughter. Finishing performance was gathered from carcass data.

Results: Steers supplemented with 3 g/day of lysine appeared to have the greatest response during the growing phase, having the heaviest body weights on day 77, and greatest average daily gains and gain:feed ratios. In the finishing phase, cattle that received 3 g/day of lysine during the growing phase maintained the weight advantage, relative to the control, established during the growing phase. Cattle receiving 6 g/day of lysine during the growing phase performed best during the finishing phase. Cattle receiving 3 and 6 g/day of lysine during the growing phase had carcasses that were 8 and 16 lb greater, respectively, than the control.

The Bottom Line: When fed corn-based diets, supplementation of ruminally-protected lysine during the growing phase may improve growth performance of cattle during the growing and/or finishing phase, leading to improvement in greater carcass weights.



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Impact of Disclosing Labeling Information on Consumer Sensory Evaluation of Ground Beef From a Similar Source

Keayla Harr

Objective: The objective of this study was to determine the effect of providing labeling information prior to evaluation on consumers' palatability ratings of ground beef from a similar source.

Study Description: Ground beef (80% lean/20% fat) from a similar source was obtained and fabricated into 0.25 lb patties. Patties were fed to consumers who evaluated each sample for different palatability traits. Consumers ($n = 105$) were informed about the labeling information of each sample prior to evaluation. Labels utilized: all natural, animal raised without added antibiotics (WA), animal raised without added hormones (WH), fresh never frozen (FNF), grass-fed, locally sourced, premium quality, U.S. Department of Agriculture organic (ORG), and a blank sample (NONE).

Results: There were no differences ($P > 0.05$) in consumer ratings for tenderness, juiciness, texture, and overall liking for all labeling terms evaluated. When ground beef was labeled as locally sourced, there were large increases ($P < 0.05$) in consumer ratings for tenderness, juiciness, flavor, texture, overall liking, and purchasing intent. Moreover, labeling ground beef as grass-fed resulted in large increases ($P < 0.05$) in consumer ratings for tenderness, juiciness, flavor, texture, and purchasing intent. Except for grass-fed, overall liking ratings increased ($P < 0.05$) when the additional labeling information was provided to consumers. Additionally, all the purchasing intent ratings increased ($P < 0.05$) when information was provided except for when the ground beef was labeled as premium quality. No differences ($P > 0.05$) were found in the percentage of samples rated as acceptable for tenderness, flavor, and texture for all the labeling terms evaluated. Labeling ground beef as all natural, grass-fed, locally sourced, and premium quality increased ($P < 0.05$) the percentage of samples rated as acceptable for tenderness. For overall acceptability, labeling ground beef as WA resulted in a decrease ($P < 0.05$) in the percentage of samples rated as acceptable.

The Bottom Line: Results from this study indicate that consumers' eating experiences are swayed by the labeling terms found on packages. Those marketing beef products to consumers need to carefully select the marketing materials utilized.



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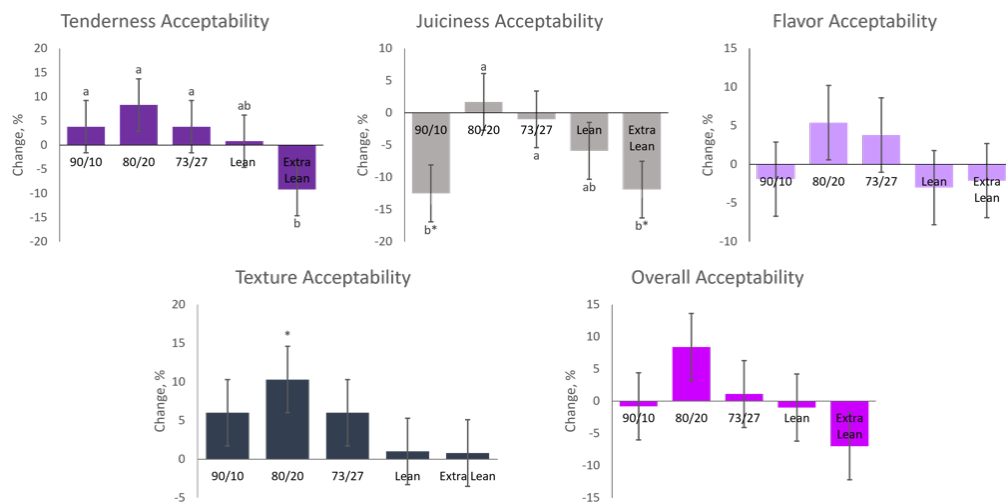
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Impact of Disclosing Fat Content on Consumer Sensory Evaluation of Ground Beef From a Similar Source

Katie Lybarger

Objective: The objective of this study was to determine the impact of providing consumers with information regarding the fat content of ground beef on the consumer's eating experience.

Study Description: Ground beef chubs that were 80% lean/20% fat (n = 15/panel type) were obtained, and 0.25-lb patties were fabricated from the chubs. Chubs were assigned randomly to panels. Panelists received samples labeled as the following: 90% lean/10% fat (90/10), 80% lean/20% fat (80/20), 73% lean/27% fat (73/27), lean, extra lean, and one sample with no information given (NONE). Samples were evaluated by consumers (n = 105), who were provided information regarding treatment labels prior to evaluation, on 0- to 100-point line scales for tenderness, juiciness, flavor, texture overall liking, and purchasing intent. Consumers also rated each trait as acceptable or unacceptable. Ground beef with 90/10, 80/20, and 73/27 labels resulted in a large increase ($P < 0.05$) in consumer ratings for tenderness, flavor, and overall liking.



Change in the percentage of samples rated as acceptable by consumers due to lean content disclosure prior to sample evaluation. Fat content presented as percentage lean/percentage fat. ^{ab} Least square means within the same trait lacking a common superscript differ ($P < 0.05$). * Mean differs from zero ($P < 0.05$).



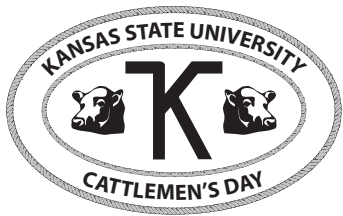
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The Bottom Line: Presenting information regarding fat content to consumers influenced perceived palatability of ground beef. Today's consumers are paying closer attention to labeling statements than in the past. Results from this study support this trend, indicating consumers' eating experiences are affected by the fat content labeling found on ground beef packages. Ground beef marketing decisions should consider the information incorporated on packaging, including fat content, as there is an impact on consumers' palatability experience.

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Changes in the Perception of Ground Beef Quality as a Result of Price Per Pound Labeling

Erin Beyer

Objective: The objective of this study was to determine the effect of perceived palatability on ground beef patties by providing consumers with differing price per pound labels.

Study Description: Ground beef chubs ($n = 15$) of 80% lean/20% fat composition were used for all samples. Patties were formed 11 days after processing into 0.25 lb patties using a commercial patty former.

Samples were cooked to 160°F and served to consumers to determine different quality attributes. Consumers were given the following prices for each sample: Ultra-High - \$6.25/lb; High - \$5.00/lb; Medium - \$3.75/lb; Low - \$2.50/lb; Ultra-Low - \$1.25/lb or no information provided (NONE).

Consumer ($n = 105$) palatability ratings¹ for 80/20² ground beef patties when additional information was given about the price

Prices ³	Tenderness	Juiciness	Flavor liking	Texture liking	Overall liking	Purchasing
Ultra-high	72.8	73.9 ^a	68.6 ^a	66.2	69.6	62.4
High	67.3	70.9 ^{ab}	61.5 ^{abc}	62.6	63.8	59.6
Medium	69.4	73.3 ^a	66.3 ^{ab}	64.7	68.8	66.8
Low	66.5	65.3 ^{bc}	59.9 ^{bc}	62.6	61.4	57.9
Ultra-low	70.7	74.0 ^a	63.9 ^{abc}	64.7	65.0	61.1
NONE	66.7	62.6 ^c	56.5 ^c	60.4	58.8	55.3
SE ⁴	2.5	2.6	2.7	2.7	3.0	3.0
P-value	0.29	< 0.01	0.02	0.62	0.06	0.07

^{a-c}Least square means within the same panel type of the same column lacking a common superscript differ ($P < 0.05$).

¹Sensory scores: 0 = not tender/juicy, dislike flavor/overall extremely, or extremely unlikely; 50 = neither tender nor tough, juicy nor dry, neither like nor dislike flavor/overall, or neither likely or unlikely; 100 = very tender/juicy, like flavor/overall extremely, or very likely.

²80% lean/20% fat ground beef.

³Prices: Ultra-High - \$6.25/lb; High - \$5.00/lb; Medium - \$3.75/lb; Low - \$2.50/lb; Ultra-Low - \$1.25/lb;

NONE - no price given/lb.

⁴SE (largest) of the least square means.

The Bottom Line: Based on this research, consumer's quality perception is affected by price variations, but not the willingness to purchase, indicating consumers are not willing to pay more for ground beef even with an improved eating experience.



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Changes in the Perception of Ground Beef Quality as a Result of Primal Labeling

Lane Egger

Objective: The objective of this study was to determine the effect of providing primal source information to consumers prior to consumption on palatability ratings of ground beef from the same source.

Study Description: Ground beef chubs that were 80% lean and 20% fat ($n = 15$) were used for testing. Samples were served to consumers as 0.25 lb patties that were cooked internally to 160°F. Consumers were asked to evaluate and assess different palatability traits and evaluated samples identified as ground chuck, ground round, ground sirloin, and store ground along with a sample that offered no information.

Percentage change in consumer ($n = 105$) ratings¹ of palatability traits when information about primal source is given on ground beef versus no information given

Treatment	Tenderness	Juiciness	Flavor liking	Texture liking	Overall liking	Purchasing intent
	----- % -----					
Ground chuck	29.1 ^{a*}	36.3 [*]	49.3 [*]	41.5 [*]	47.4 [*]	64.8 [*]
Ground round	14.6 ^{b*}	29.0 [*]	45.9 [*]	36.1 [*]	27.6 [*]	59.7 [*]
Ground sirloin	25.3 ^{ab*}	34.3 [*]	69.0 [*]	33.6 [*]	45.5 [*]	73.1 [*]
Store ground	17.3 ^{b*}	29.5 [*]	50.5 [*]	25.1 [*]	28.1 [*]	54.7 [*]
SE ²	7.2	8.8	22.1	9.4	13.5	23.5
<i>P</i> -value	0.04	0.40	0.25	0.21	0.27	0.52

¹Percentage change in ratings: (consumer trait scores – consumer blank scores)/consumer blank scores.

²Standard error (largest) of the least squares means.

^{ab}Least square means within the same panel type of the same column lacking a common superscript differ ($P < 0.05$).

*Mean differs from 0 ($P < 0.05$).

The Bottom Line: Based on this research, the addition of primal source labeling improves consumer perception of the palatability traits of ground beef and the likelihood of consumer purchase.



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Trained Sensory Panel Evaluation of the Impact of Bone-In Versus Boneless Cuts on Beef Palatability

Kaylee Farmer

Objective: The objective of this study was to determine palatability traits of beef cuts of differing bone status and quality grade.

Study Description: Paired (n = 12 pairs; 24 total/cut/grade) boneless ribeye rolls, export ribs, and short loins were procured. Short loins were fabricated into boneless strip loins with corresponding bone-in tenderloins, or bone-in strip loins with boneless tenderloins. Post-aging, subprimals were fabricated into steaks that were randomly selected for further analysis. A total of 18 trained sensory panels were conducted at the Kansas State University Meat Science Sensory Lab to determine differences in palatability traits.

Results: In totality, bone status had a minimal impact on palatability traits. Nonetheless, bone-in tenderloins and bone-in ribeyes were rated more flavorful ($P < 0.05$) than boneless cuts from the same muscle. There were no beef ($P > 0.05$) flavor intensity differences observed for bone-in and boneless strip steaks. Bone state had no effect ($P > 0.05$) on initial juiciness, myofibrillar tenderness, overall tenderness, or Warner-Bratzler shear force (WBSF) for any cut. Bone-in strip loin samples were rated juicier ($P < 0.05$) than tenderloins and boneless ribeye samples. Tenderloin samples were rated higher ($P < 0.05$) for myofibrillar and overall tenderness than strip loin and ribeye steaks, which were which were rated similar ($P > 0.05$) by trained panelists. Furthermore, there was no difference ($P > 0.05$) in the WBSF values for strips and ribeyes, with tenderloin samples having the lowest ($P < 0.05$) average peak force. Lastly, USDA Choice samples were rated higher ($P < 0.05$) for all palatability traits and had lower ($P < 0.05$) WBSF values than Select samples.

The Bottom Line: A similar overall eating experience could be derived from a boneless or bone-in steak from the same cut and quality grade.



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Native Beef Collagenase MMP-9 May Contribute to Tenderness Improvement by Degrading Connective Tissues in Extended Aged Beef

Larissa A. Koulicoff

Objective: Collagen is one of the main components in the connective tissue (CT) and contributes to background toughness in beef. It is known that in living animals, collagen can be degraded and remodeled by collagenase matrix metalloproteinases (MMP); however, it is unclear if collagenase MMP can impact CT texture during postmortem aging of beef. Therefore, this study aimed to understand how collagenase MMP activity may impact postmortem connective tissue degradation in beef in three different cuts and four different aging periods.

Study Description: Beef boneless striploin, top sirloin butt, and heel were acquired from 10 U.S. Department of Agriculture high choice beef carcasses and assigned to be aged for 3, 21, 42, or 63 days ($n = 120$). Following each aging time, Warner-Bratzler shear force (WBSF), connective tissue shear force (CTSF), trained panel responses, collagen content, denaturation temperature of connective tissue, collagen crosslinks density, connective tissue degradation product, and native collagenase activity were measured, and collagenase identity was identified as MMP-9 through Western blot.

Results: Striploin was considered the most tender muscle ($P < 0.01$), and tenderness was improved ($P < 0.01$) after 21 days of aging. In addition, CTSF data and trained panelists demonstrated softening ($P < 0.05$) of CT after 21 days of aging. Heel and top sirloin butt did not differ ($P > 0.10$) in collagen content and had greater ($P < 0.01$) collagen content than striploin. However, no aging effect was found for collagen content ($P > 0.10$). Denaturation temperature of CT decreased and collagen crosslinks density increased after 42 days of aging for all cuts evaluated in this study ($P < 0.01$). The MMP-9 activity decreased ($P < 0.01$) from 3 to 21 to 42 days, and it had the greatest ($P < 0.01$) activity in heel compared to the other two cuts. Heel and striploin had greater ($P < 0.01$) connective tissue degradation product than top sirloin butt. It was interesting to note that while striploin and heel showed a decrease ($P < 0.05$) in the degradation product from 3 to 21 to 42 days, top sirloin butt did not show any changes ($P > 0.10$) in degradation product during the entire 63 days of aging period.

The Bottom Line: These results provide an explanation on CT softening during postmortem aging. Understanding the mechanism of tenderness improvement from the softening of CT may help the industry improve the eating quality of lower quality beef cuts.

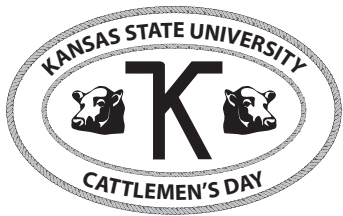


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An Investigation on the Influence of Various Biochemical Tenderness Factors on Eight Different Bovine Muscles

Peang A. Hammond

Objective: Beef tenderness is a complex palatability trait with many tenderness-contributing components. The objective of this study is to understand the relative contribution of each tenderness component to eight different beef muscles.

Study Description: Top sirloin butt, ribeye, brisket, flank, knuckle, eye of round, mock tender, and shoulder clod were collected from 10 U.S. Department of Agriculture high choice beef carcasses and assigned to a 2- or 21-day aging period (n = 160). Protein degradation, collagen content, mature collagen crosslink density, intramuscular lipid content, pH, shear force, and trained sensory panel analysis were determined. A Pearson correlation analysis was used to determine the relationship between each tenderness contributor measured in this study to the overall tenderness evaluated by the trained panelist.

Results: Overall tenderness of ribeye, flank, eye of round, and shoulder clod were largely driven by the protein degradation of muscle fibers (effect of aging). On the other hand, overall tenderness for brisket was determined by collagen content and crosslink density (effect from connective tissue). Finally, overall tenderness of top sirloin butt was strongly correlated with lipid content. When all the cuts were combined together and analyzed as a whole (n = 160), all of the biochemical measurements conducted in this study played a small but important role as an overall tenderness contributor.

The Bottom Line: Results from this study filled in some of the knowledge gap on the relative contribution of each tenderness component to the overall perception of tenderness from each cut. The industry can utilize this information to provide tenderness management strategies for each cut as well as improve the robustness of current tenderness predicting technology.

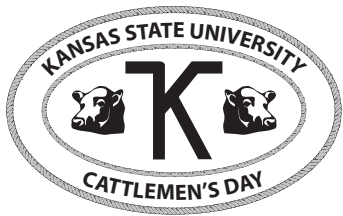


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Exploring the Potential Effect of Phospholipase A₂ Antibody to Extend Beef Shelf-Life in a Beef Liposome Model System

Colin K.Y. Chun

Objective: The objective of this study was to utilize a beef liposome model system to investigate if phospholipase-A₂ antibody (aPLA₂) can be used to inhibit phospholipase-A₂ (PLA₂) activity to potentially improve beef shelf-life.

Study Description: Phospholipids (PL) from 10 U.S. Department of Agriculture choice beef striploin steaks were extracted and split into six treatments: PL (25 mg of PL); aPLA₁₀ (PL + 25 µg of aPLA₂); aPLA₂₀ (PL + 50 µg of aPLA₂); PLA₂ (PL + 10 µg of PLA₂); PLA₂+aPLA₁₀ (PL + PLA₂ + aPLA₁₀); and PLA₂+aPLA₂₀ (PL + PLA₂ + aPLA₂₀). The model system was under retail display at 39°F and 2300 lux for 7 days. At day 0, aliquots were taken for PL profiling and product ion analysis. At days 0, 1, 4, and 7, aliquots were taken for lipid oxidation analysis.

Results: At day 7 of display, PLA₂, PLA₂+aPLA₁₀, and PLA₂+aPLA₂₀ treatments had greater lipid oxidation ($P < 0.01$) compared to the samples without PLA₂. This trend was seen in the other retail display periods. Interestingly, day-7 aPLA₁₀ and aPLA₂₀ had less lipid oxidation than day-7 PL and less oxidation than day-4 PLA₂ ($P < 0.05$). The PL profile analysis showed clear differences between treatments with or without the addition of PLA₂. The PLA₂ treatments showed greater relative percent of total PL degradation products ($P < 0.01$) than treatments without PLA₂. The PLA₂ treatments had less relative percent of total ether-linked phosphatidylcholine (ePC) than treatments without PLA₂ ($P < 0.01$). It appears that aPLA₂ had no effect on inhibiting PLA₂ hydrolysis as there was no difference ($P > 0.10$) between PLA₂ and aPLA+PLA₂ treatments in relative percent of total ePC, phosphatidylcholine (PC), or in PL degradation products.

The Bottom Line: Phospholipase-A₂ significantly alters beef phospholipids to a composition that is potentially susceptible to lipid oxidation. At day-7 of retail display, there is significant lipid oxidation from PLA₂ added treatments, yet the aPLA₂ only treatments seem to present an antioxidant effect. Effectively inhibiting PLA₂ activity can potentially improve beef shelf-life stability.



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SUMMARY PUBLICATION

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