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CATTLEMEN'S DAY 2014

Cattlemen's Day 2014

Beef Cattle Research

Summary Publication

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CATTLEMEN'S DAY 2014

BEEF CATTLE RESEARCH

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Cattlemen's Day 2014

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Meat and Food Safety

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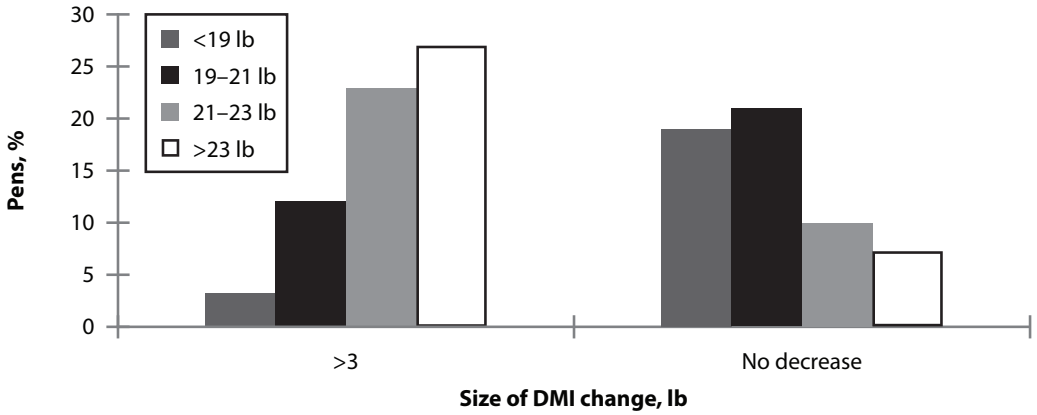
Dry Matter Intake Decreases When Feeding Zilmax During the Summer

Chris Reinhardt

Objectives: Evaluate relationships between feed dry matter intake before and after initiation of Zilmax (Merck Animal Health; Summit, NJ) feeding in three commercial feedyards and determine how this relationship is affected by season, gender, and pre-Zilmax feed intake.

Study Description: 1,515 pens of steers and heifers fed at three commercial feedlots in Kansas were used to investigate the prevalence and extent of changes in dry matter intake (DMI) after initiation of Zilmax feeding. Feed intake after introduction of Zilmax decreased in 75% of pens and increased in 25% of pens. Feed intake declined within one day after initiation of ZIL feeding; however, this effect was greater in the summer and winter than during the spring or fall. As pre-Zilmax feed intake increased, percentage of pens with a decrease in feed intake after introduction of Zilmax also increased.



The Bottom Line: Because dry matter intake of cattle fed Zilmax declines during the summer months and for cattle consuming greater amounts of dry matter prior to feeding Zilmax, performance and quality grade projections should be adjusted accordingly.

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High-Dose Implants Improve Gain and Efficiency in Feedlot Steers

Chris Reinhardt

Objectives: Conduct a meta-analysis of existing data from peer-reviewed as well as industry sources to compare the effects of using implants containing 20:200 (mg estradiol:mg trenbolone acetate) vs. 24:120 on feedlot performance and carcass traits of steers.

Study Description: Individual trials were pooled to analyze the overall effects of different implant doses on feedlot performance and carcass traits.

Results: Implanting with 20:200 increased average daily gain and reduced feed:gain and percentage of carcasses grading Choice or greater compared with 24:120.

The Bottom Line: Modern production practices and costs of production mandate that small improvements in productivity at the individual animal level, if real, must be investigated and captured.

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Performance and Health Effects of Zuprevo 18 in Newly Received, Highly Stressed Beef Cattle

Ethan Schlegel

Objectives: Determine the health and performance effects of Zuprevo 18% (tildipirosin, 4 mg/kg body weight; Merck Animal Health; Summit, NJ) during a 42-day backgrounding period when administered to high-risk transported cattle within 24 hours after arrival.

Study Description: 721 high-risk calves, over 4 phases from 2012–2013, were randomly assigned to one of two experimental treatments: Control (no metaphylaxis), or mass medication on arrival with Zuprevo. Calves were fed a common diet for 42 days and monitored once daily for clinical signs of bovine respiratory disease. Calves were weighed at day 42, and dry matter feed consumption, average daily gains, feed efficiencies, morbidity, mortality, first-treatment success rates, chronicity rates, and case fatality rates were determined for each pen.

Model-adjusted means and corresponding 95% confidence intervals (CI), by treatment group, for important health outcomes[1]

		Control (24 pens; 309 head)			Zuprevo (32 pens; 412 head)		
Item	*P*-value[2]	Mean (SEM)	Lower CI	Upper CI	Mean (SEM)	Lower CI	Upper CI
Respiratory disease morbidity, %	<0.01	65.6 (5.10)	54.9	74.9	38.2 (5.01)	28.9	48.5
First-treatment success rate, %	0.051	48.0 (3.82)	40.5	55.6	58.0 (4.19)	50.1	66.1
Case fatality rate, %	0.97	9.9 (2.75)	5.6	16.8	9.3 (2.92)	5.3	17.3
Chronicity rate (≥3 treatments), %	<0.01	19.7[a] (3.04)	14.3	26.4	8.7[b] (1.64)	5.8	12.5
Overall mortality rate, %	0.31	7.07 (1.93)	4.1	12.0	5.25 (1.45)	3.0	9.0

[1] Models included random effects to account for the lack of independence among pens within study phases.
[2] Where the *P*-value for an overall treatment effect was ≤0.10, treatment group means with different superscripts within rows differed significantly ($P < 0.05$).

The Bottom Line: Pens given Zuprevo on arrival had significantly lower respiratory disease morbidity rates and fewer chronic cattle compared with pens that were not mass-medicated on arrival.

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Comparison of Conventional and Alltech Beef PN Finishing Programs: Performance and Carcass Characteristics

Kelsey Phelps

Objective: To evaluate effects of the PN Feed Program, alone or in combination with exogenous growth promotants, on feedlot performance and carcass characteristics.

Study Description: We fed 512 crossbred steers in our experiment for 175 days to compare the Alltech (Nicholasville, KY) PN Beef program to traditional feed additives, in the presence or absence of exogenous growth promotants. Steers were assigned to either a conventional finishing diet or a diet using the Alltech PN Receiver and Finisher supplements. Both diets were fed with or without the use of exogenous growth promotants (Component implants and Optaflexx; Elanco Animal Health, Greenfield, IN). After 175 days, animals were harvested and carcass data were collected.

Feedlot performance and carcass characteristics of steers fed conventional feedlot diets or Alltech PN Program diets with and without exogenous growth promotants (EGP)

	Conventional		Alltech PN		
Item	EGP-	EGP+	EGP-	EGP+	SEM
Dry matter intake, lb/day	21.83[a]	23.61[b]	21.73[a]	24.48[c]	0.28
Average daily gain, lb	2.62	3.55	2.62	3.57	0.05
Feed:gain	8.29	6.6	8.29	6.85	0.12
Carcass weight, lb	825.3	933.7	832.9	932.0	11.1
Liver abscesses, %	12.6	12.6	22.5	15.5	3.6

[a,b,c] Values within a row with different letters are significantly different ($P < 0.05$).

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The Bottom Line: Replacing conventional feedlot diets with Alltech PN Program diets yielded similar feedlot performance and carcass characteristics, and the use of implants and Optaflexx greatly improves feedlot performance and carcass characteristics in both systems.

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Udder Quality is Moderately Heritable in Hereford Cattle

Heather Bradford

Objective: Estimate the heritabilities and genetic correlations for udder quality traits in Hereford cattle.

Study Description: Records for overall score, udder suspension, and teat size were obtained from the American Hereford Association. A total of 188,524 records and a three-generation pedigree with 196,540 animals were used in the analysis. A multiple-trait animal model with random effects of additive genetic and permanent environment and fixed effects of cow age and contemporary group was used. Contemporary group was the combination of herd, calving year, and calving season.

Results: The heritabilities were 0.32 ± 0.01 for overall score, 0.31 ± 0.01 for suspension, and 0.28 ± 0.01 for teat size. All traits were moderately heritable, meaning progress can be made through genetic selection.

Genetic correlations between traits were 0.72 ± 0.02 for overall score and teat size, 0.70 ± 0.02 for overall score and suspension, and 0.83 ± 0.01 for suspension and teat size. The genetic correlations were all strong and positive; thus, selection for one trait should result in improvement in the other two traits as well. These results were consistent with previous research in beef cattle.

The Bottom Line: Udder quality was moderately heritable with strong genetic correlations between udder traits, meaning producers can use genetic selection to improve udder quality.

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Heifer Calving Rate is Lowly Heritable in Hereford Cattle

Heather Bradford

Objective: Estimate the heritability of heifer calving rate, an economically relevant trait.

Study Description: Calving records on females born from 2000 through 2009 were obtained from the American Hereford Association. Calving records on 98,844 females and a six-generation pedigree with 289,141 animals were analyzed with a multiple-trait logistic animal model with a random effect for additive genetics and fixed effects for contemporary group and age at calving. There were 4,745 contemporary groups, defined as the combination of herd, yearling weigh date, and yearling group.

Results: The heritability estimate for heifer calving rate was 0.15 ± 0.01. Like most reproductive traits, this trait was lowly heritable. Yet, the reproductive success of heifers is relatively easy to measure through the American Hereford Association's whole-herd reporting system, making heifer calving rate a practical trait for selection. Genetic selection for heifer calving rate can increase the likelihood that a sire's daughters will calve as heifers.

The Bottom Line: Heifer calving rate was lowly heritable, but producers can use selection to improve genetic merit for reproductive performance.

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Relationships Between Docility and Reproduction in Angus Heifers

Kari White

Objective: Explore the possible relationships between docility and pregnancy rate. It has been hypothesized that differences in temperament scores and associated cortisol levels of heifers are associated with differences in pregnancy rate.

Study Description: A total of 337 first-calf heifers were used in this study from three different cooperator herds. Fecal and blood samples were collected and analyzed for cortisol concentrations. Data were analyzed using logistic regression to determine the factors that influenced pregnancy rate. Contemporary group based on ranch was fit as a fixed effect, whereas fecal cortisol, blood cortisol, exit velocity, chute score, weight, and age were included as covariates. Correlations were also calculated.

Results: We detected no significant predictors of 30-day pregnancy for two of the three ranches from the combined data; however, the chute score ($P < 0.0348$) and weight ($P < 0.0082$) were found to have an odds ratio estimate different than 1 as significant predictors of 30-day pregnancy. There were many significant correlations between covariates.

The Bottom Line: Although the results from our combined data were not conclusive for predictors of 30-day pregnancy, results from one ranch and variation in measures of temperament and reproductive status showed that these traits can be improved.

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Docility and Heifer Pregnancy Estimates in Angus Heifers

Kari White

Objective: Obtain heritability estimates for docility and heifer pregnancy in Angus heifers.

Study Description: Data for this study included approximately 148,139 records, with 10,137 sires and 92,471 dams represented. We formed 25,736 contemporary groups from weaning, yearling, and breeding contemporary groups. Heifer pregnancy was a threshold model with animal and contemporary groups as random effects and age at first breeding as a covariate. Docility was a linear animal model, with animal and contemporary groups as random effects.

Results: The heritability of heifer pregnancy was estimated as 0.16 ± 0.02. These findings are similar to those by other researchers who found heifer pregnancy heritabilities between 0.14 and 0.21. The heritability of docility was estimated to be 0.22 ± 0.03, which is lower than those reported by the North American Limousin Foundation (0.40) and the American Angus Association (0.37).

The Bottom Line: Moderate heritability estimates of heifer pregnancy and docility indicate that although progress may be slow, genetic improvement through selection can be made on these traits.

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Temperament Can Be an Indicator of Feedlot Performance and Carcass Merit in Beef Cattle

Kerri Bates

Objective: Investigate the relationships between cattle temperament (measured by chute score and exit velocity), immunological factors, and a range of economically relevant performance traits.

Study Description: Cattle temperament measured by chute score and exit velocity, weights, and gains were recorded throughout their time in the feedlot (140 days). Factors affecting immune function (interleukin-8 and cortisol) were also recorded at the time of feedlot placement. Carcass traits, including hot carcass weight, marbling score, yield grade, ribeye area, and fat thickness were recorded post-harvest. Resulting phenotypic relationships between temperament, immunological factors, and carcass merit were then determined.

Results: Small negative correlations were found between exit velocity at the time of re-implant and weight at the time of re-implant (r = -0.10; $P < 0.001$), weight at day 140 (r = -0.11; $P < 0.001$), total gain in the feedlot (r = -0.12; $P < 0.001$), and hot carcass weight (r = 0.08; $P < 0.001$), suggesting that more temperamental cattle will have decreased feedlot performance and carcass merit than their calmer peers.

The Bottom Line: Evidence from this study indicates that calmer cattle generally perform better during the finishing phase and may be more profitable as a result.

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Genetic Relationships Among Temperament, Immune Function, and Carcass Merit in Beef Cattle

Kerri Bates

Objective: This study was conducted to investigate the genetic relationships between cattle temperament measured by chute score and exit velocity, immunological factors, and a range of economically relevant carcass performance traits.

Study Description: Cattle temperament (measured by chute score and exit velocity), weights, and gains were recorded throughout their time in the feedlot (140 days). Factors affecting immune function (interleukin-8 and cortisol) were also recorded at the time of feedlot placement. Carcass traits, including hot carcass weight, marbling score, yield grade, ribeye area, and fat thickness were recorded post-harvest. Resulting genetic relationships between temperament, immunological factors, and carcass merit were then determined.

Results: Results from this study indicate that cortisol and temperament measures all have negative genetic relationships with bovine respiratory disease susceptibility in beef cattle, and more temperamental cattle do not seem to be inherently more susceptible to bovine respiratory disease incidence in the feedlot segment. Measures of temperament are genetically correlated with one another, and exit velocity is estimated to be more repeatable that chute score. Genetic correlations indicate that cattle with genetic potential to be more aggressive or fearful will have genetics for greater ribeye area, reduced marbling score, and reduced yield grade.

The Bottom Line: Evidence from this study indicates that genetically more temperamental cattle generally have larger ribeye area, reduced marbling score, and reduced yield grade, but they don't have a genetic advantage in resistance to bovine respiratory disease.

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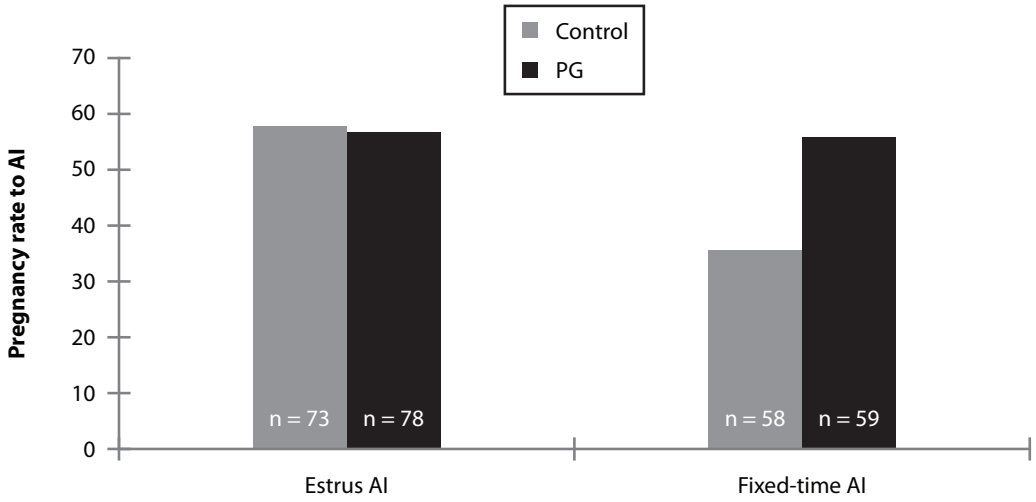
Administration of Prostaglandin to Beef Heifers at Time of Artificial Insemination

Sandy Johnson

Objective: Determine if administration of prostaglandin $F_{2\alpha}$ (PG) at the time of insemination would improve the pregnancy rate of artificial insemination (AI) when insemination occurred after observed estrus or at a single fixed time.

Study Description: Estrus was synchronized in yearling heifers (n = 268) with a standard melengesterol acetate-PG (MGA-PG) protocol, and insemination occurred after an observed estrus or a fixed-time AI. At the time of insemination, every other heifer received PG. The pregnancy rate was determined via ultrasonography 42 days after AI.

Results: Pregnancy rate to artificial insemination tended ($P < 0.06$) to be higher in heifers inseminated after observed estrus (57%) than timed-AI (46%). The interaction of insemination type with PG treatment at AI tended to be significant ($P < 0.08$). Pregnancy rate to AI was lowest in fixed-timed AI heifers that did not receive PG at insemination. Further research is needed to clarify whether administration of PG at the time of insemination may improve conception to fixed-time AI.



The Bottom Line: This study provides evidence that insemination after observed estrus tends to produce more AI pregnancies than fixed-timed AI. Furthermore, MGA-PG protocol and administration of prostaglandin $F_{2\alpha}$ at the time of insemination may improve conception rates of heifers exposed to fixed-time AI.

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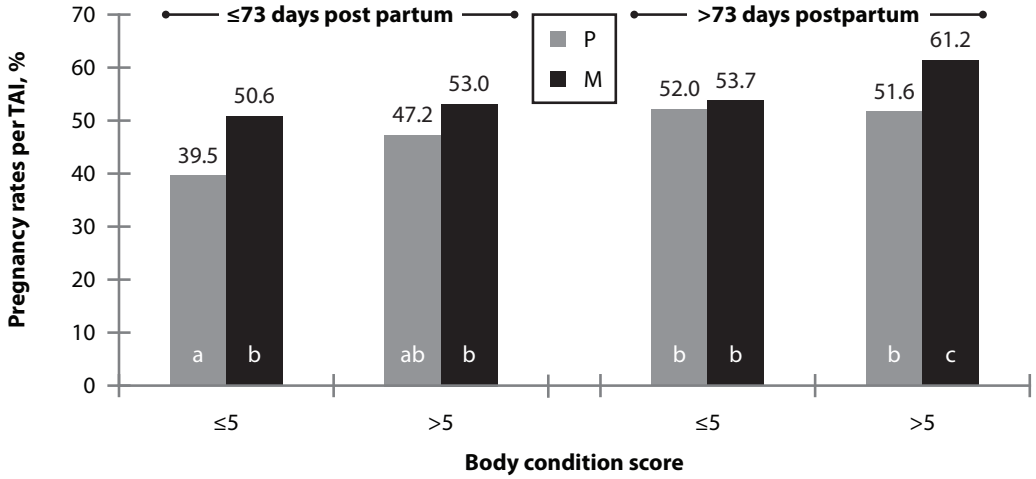
Variation in Timed Artificial Insemination Pregnancy Rates in Specific Groups of Suckled Beef Cows

Scott L. Hill

Objective: This research examined if groups of cows selected by progesterone status, parity, body condition score, or days postpartum would vary in pregnancy rates compared with unselected cows when subjected to the CO-Synch + controlled internal drug release + (CIDR) timed artificial insemination (TAI) procedure.

Study Description: A total of 1,277 primaparous and 5,676 multiparous cows were included in this analysis. Ten days before all cows were submitted to a CO-Synch + CIDR TAI procedure, body condition scores were assigned. The procedure was initiated with100 μg gonadotropin-releasing hormone and insertion of a CIDR insert followed in either 5 or 7 days with CIDR insert removal and intramuscular administration of 25 mg prostaglandin $F_{2\alpha}$. A second gonadotropin-releasing hormone treatment was administered, and insemination was performed from 56 to 72 hours after CIDR insert removal.

Results: Cows that had at least two calves, had a body condition score greater than 5, and were more than 73 days since calving had a greater ($P < 0.05$) TAI pregnancy rate than any other group of cows. Primiparous cows with poorer body condition scores and fewer days postpartum had fewer ($P < 0.05$) pregnancies per AI than their counterparts that calved earlier (39.5 vs. 52%, respectively).



The Bottom Line: Grouping cows according to age, body condition score, and days since calving can result in greater TAI pregnancy rates. Targeted protocols applied to specified cow groups may reduce the cost per timed AI pregnancy.

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Effects of Corn Steep Liquor Supplementation on Performance and Herbivory Patterns of Beef Cows Grazing Native Range Infested with Sericea Lespedeza (*Lespedeza Cuneata*)

Garrett Preedy

Objective: Evaluate the effects of supplementing corn steep liquor on herbivory patterns and performance of beef cows grazing native tallgrass rangeland infested with sericea lespedeza.

Study Description: Our study was conducted from May 1 through October 1, 2011, in Chautauqua County, KS, on nine native tallgrass pastures located approximately 10 miles southeast of Sedan. Crossbred beef cows and calves (145 pairs) were assigned randomly to treatments consisting of no supplementation or supplementation with corn steep liquor. Supplementation began June 1 and was delivered three times per week in portable feed bunks. Delivery of corn steep liquor was prorated for an average daily intake of 1.0 gallon/cow daily. Herbivory of individual sericea plants was estimated visually in each pasture at the end of the study (October 1).

Effects of corn steep liquor supplementation on range forage biomass, sericea lespedeza biomass, and sericea lespedeza herbivory by beef cows and calves grazing native tallgrass pastures

Item	Unsupplemented	Supplemented	SEM	*P*-value
Initial total forage biomass, lb dry matter/acre	1,852	2,019	809	0.87
Average total forage biomass, lb dry matter/acre	2,312	2,445	867	0.88
Final total forage biomass, lb dry matter/acre	3,309	4,014	809	0.52
Initial sericea lespedeza biomass, lb dry matter/acre	231	310	568	0.92
Average sericea lespedeza biomass, lb dry matter/acre	703	1,048	563	0.55
Final sericea lespedeza biomass, lb dry matter/acre	1,939	2,214	568	0.72
Sericea lespedeza stems grazed, % of total	80.2	94.2	6.7	0.09

The Bottom Line: Supplementation of cow-calf pairs with corn steep liquor was associated with increased herbivory of sericea lespedeza during the summer grazing season. As expected, supplementation did not have an immediate, pasture-scale influence on sericea lespedeza biomass availability; however, we speculate that repeated use of corn steep liquor supplementation on sericea lespedeza-infested tallgrass pastures may impair seed-producing capabilities of sericea lespedeza, ultimately leading to a decline in this invasive plant species.

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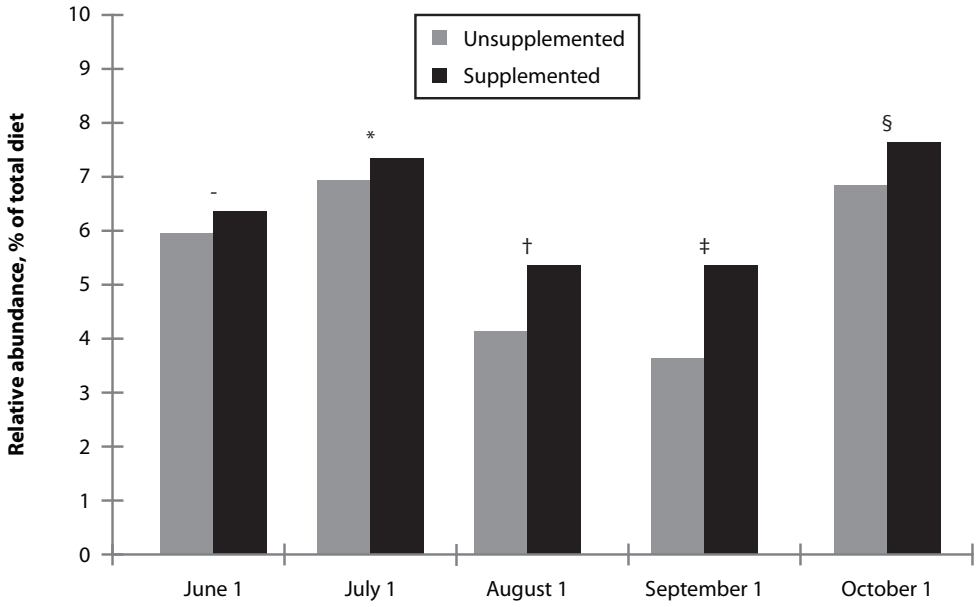
Botanical Composition of Beef Cow Diets Shifts When Native Range Infested with Sericea Lespedeza (*Lespedeza Cuneata*) is Supplemented with Corn Steep Liquor

Garrett Preedy

Objective: Evaluate the effects of supplemental corn steep liquor on botanical composition of the diets of beef cows grazing native tallgrass rangeland infested with sericea lespedeza in the Kansas Flint Hills.

Study Description: Our study was conducted from May 1 through October 1, 2011, in Chautauqua County, KS, on nine native tallgrass pastures located approximately 10 miles southeast of Sedan. Crossbred beef cows and calves (145 pairs) were assigned randomly to treatments consisting of no supplementation or supplementation with corn steep liquor. Supplementation began June 1 and was delivered three times each week in portable feed bunks. Delivery of corn steep liquor was prorated for an average daily intake of 1.0 gallon per cow daily. Botanical composition of beef cow diets was estimated using fecal microhistology.



- Baseline value at beginning of study. Treatments not different; $P > 0.10$.
* July 1 consumption of sericea similar for supplemented and unsupplemented cows; $P = 0.93$.
† August 1 consumption of sericea greater for supplemented than for unsupplemented cows; $P < 0.01$.
‡ September 1 consumption of sericea greater for supplemented than for unsupplemented cows; $P < 0.01$.
§ October 1 consumption of sericea similar for supplemented and unsupplemented cows; $P = 0.35$.

The Bottom Line: Supplemental corn steep liquor increased beef cow tolerance for and acceptance of high-condensed tannin sericea lespedeza in a commercial-scale, native-range production system. We conclude that supplemental corn steep liquor allowed for a desirable change in selection preference by beef cows that stemmed from a critical modification of the post-ingestive consequences associated with condensed tannin consumption.

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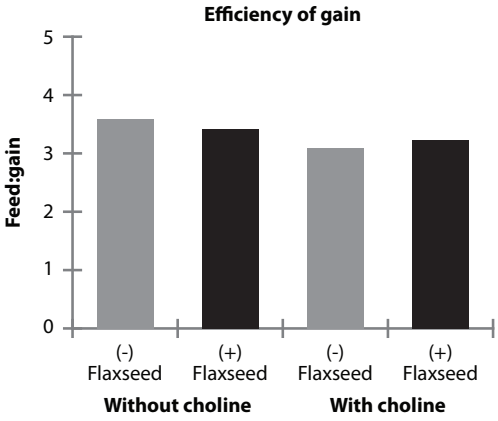
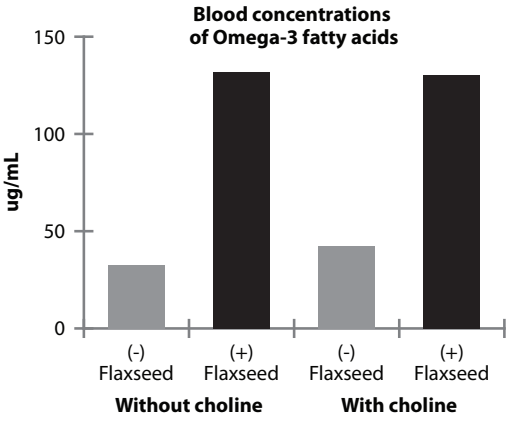
Combining Ruminally Protected Choline and Flaxseed in Cattle Diets to Increase the Assimilation of Omega-3 Fatty Acids from the Diet

Caleb Weiss

Objective: Determine if feeding ruminally protected choline could improve the absorption efficiency of dietary omega-3 fatty acids in growing cattle.

Study Description: Crossbred heifers (108 heifers; 628 ± 30 lb body weight) were stratified by initial body weight and allocated randomly to one of four dietary treatments: (1) no flaxseed/no choline; (2) with flaxseed/no choline; (3) with choline/no flaxseed; and (4) with flaxseed and choline. Heifers were fed their respective diets for 14 days. Blood samples were collected on day 14 and analyzed for concentrations of omega-3 fatty acids.





The Bottom Line: Feeding flaxseed for 14 days resulted in large changes in blood concentrations of omega-3 fatty acids, but adding choline to heifer diets had no impact on utilization of dietary omega-3 fatty acids.

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Wheat Straw Improved by Half-Rate Application of Anhydrous Ammonia

Justin Waggoner

Objective: Determine if the recommended rate of 3% anhydrous ammonia application (dry weight) could be reduced by half. Anhydrous ammonia was applied to wheat straw at application rates of 1.5% (HALF) or 3.0% (FULL) on a dry matter basis (30 or 60 lb of anhydrous ammonia/ton of dry forage) to evaluate effects on forage quality and *in vitro* dry matter disappearance (an estimate of digestibility).

Study Description: Approximately 130 to 140 round bales of wheat straw were arranged in two separate stacks (3-2 configuration) at each of 6 independent locations. Stacks were assigned randomly to HALF or FULL rate anhydrous treatments. Forage samples were obtained prior to and 14 days after anhydrous application for analysis of dry matter, crude protein, acid detergent fiber, total digestible nutrients, and *in vitro* dry matter disappearance.

Mean acid detergent fiber, crude protein, and *in vitro* dry matter disappearance of wheat straw before (pretreatment) and following application of 1.5 (HALF) or 3.0% (FULL) anhydrous ammonia on a dry basis

		Ammoniation rate			
Item	Pretreatment	HALF	FULL	SEM	*P*-value
Dry matter, %	92.1	91.0	91.1	1.01	0.68
Crude protein, %[1]	3.3[a]	8.6[b]	10.8[c]	0.50	<0.01
Acid detergent fiber, %	51.0	51.9	52.1	1.34	0.84
Total digestible nutrients, %	33.2	32.5	32.3	1.90	0.93
IVDMD, %[2]	31.0[a]	42.0[b]	46.2[c]	1.60	<0.01

[1] Linear effect, $P < 0.01$; quadratic effect, $P = 0.02$.
[2] *In vitro* dry matter disappearance; linear effect, $P < 0.01$; quadratic effect, $P = 0.10$.
[a,b,c] Within a row, means without a common superscript are different ($P \leq 0.10$).

The Bottom Line: The feeding value of wheat straw may be improved by treating with anhydrous ammonia at application rates as low as 1.5% of dry matter weight of the stack (30 lb anhydrous ammonia per dry ton of forage).

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Evaluation of Ammoniated Wheat Straw in Receiving and Growing Diets

Ethan Schlegel

Objectives: Compare performance of newly received and growing calves fed total mixed rations containing wheat straw, ammoniated wheat straw, or a blend of prairie hay and alfalfa hay, each fed at 30% of the diet dry matter.

Study Description: 288 steers were randomly assigned to three experimental diets containing 30% (dry matter basis) of either wheat straw, ammoniated wheat straw, or a blend of prairie hay and alfalfa hay. Diets also contained 40% wet corn gluten feed, dry-rolled corn, and supplement. Calves were fed their respective diets daily for 56 days, after which they were fed a common diet (the alfalfa hay prairie hay diet) for an additional 14 days to equalize gut fill. Calves were weighed on days 0, 28, 56, and 70. Dry matter intakes, average daily gains, and feed efficiencies were determined for each pen of calves.

Growth performance of crossbred steers fed diets containing wheat straw, ammoniated wheat straw, or a blend of prairie hay and alfalfa hay (Control) at 30% inclusion during the receiving and growing periods

Item	Control	Wheat straw	Ammoniated wheat straw	SEM	*P*-value
Dry matter intake, lb/day					
Day 0 to 28	16.54	16.85	16.53	0.32	0.52
Day 0 to 56	18.76	18.37	18.60	0.38	0.60
Day 0 to 70	19.69	19.02	19.28	0.62	0.19
Day 56 to 70	23.42[a]	21.58[b]	22.00[b]	0.43	<0.001
Average daily gain, lb					
Day 0 to 28	3.08	3.15	3.16	0.12	0.78
Day 0 to 56	3.45[a]	3.09[b]	3.14[b]	0.14	<0.001
Day 0 to 70	3.13[a]	2.91[b]	2.89[b]	0.07	<0.001
Day 56 to 70	1.88	2.18	1.89	0.28	0.39
Feed:gain, lb/lb					
Day 0 to 28	5.35	5.34	5.21	0.05	0.73
Day 0 to 56	5.45[a]	5.94[b]	5.94[b]	0.15	<0.001
Day 0 to 70	6.28[a]	6.53[b]	6.67[b]	0.16	0.01
Day 56 to 70	12.30	9.79	11.40	1.89	0.19

[a,b,c] Means in a row without a common superscript are different, $P < 0.05$.

The Bottom Line: Ammoniation of wheat straw provided no advantage over untreated wheat straw under the conditions of this experiment.

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BEEF CATTLE RESEARCH

Consumption and Performance of Beef Heifers Provided Dried Distillers Grains in a Self-Fed Supplement Containing Either 10 or 16% Salt While Grazing Flint Hills Native Grass

Nick Melton

Objectives: Evaluate performance of grazing beef heifers fed dried distillers grains (DDGS) in a self-fed fashion with either 10 (LOW) or 16% (HIGH) stock salt in comparison to that of unsupplemented heifers (CONTROL). Concern over the effects of drought in previous years focused our attention to ensuring that nutritional resources would be adequate to provide for a 78-day grazing period when grazing density was increased from 200 (CONTROL) to either 225 or 250 lb of beef per acre.

Study Description: 279 heifers were randomly assigned to one of three experimental treatments in a 78-day grazing study that was initiated in May 2013. The HIGH and LOW treatments consisted of DDGS mixed with 16 or 10% salt, respectively, to limit daily intake of DDGS to 0.60 and 1.0% of body weight, respectively. Starting on June 17, the treatments were provided to the respective pastures for the remainder of the study. Calves were weighed at the beginning and end of the study, and dry matter intake of DDGS, average daily gains, and supplement efficiencies were determined for each paddock of calves.

Performance of stocker heifers provided supplements of dried distillers grains with solubles (DDGS)

		(Percentage salt) in DDGS			
Item	CONTROL	HIGH (16%)	LOW (10%)	SEM	*P*-value
No. of pastures	4	4	4		
No. of cattle	85	100	94		
Initial weight, lb	582	580	579	1.08	0.17
Final weight, lb	730	768	784	6.71	0.001
Average daily gain, lb/day	1.91	2.41	2.62	0.09	0.001
Total DDGS per heifer, lb (dry basis)		162	304	22.4	0.004
DDGS/heifer, lb/day (dry basis)		(3.4)	(6.4)		
lb DDGS/lb added gain		7.69	11.15	2.00	0.27

The Bottom Line: Providing DDGS with salt improves performance of heifers compared with those without supplemental DDGS, but no significant differences were detected in performance and efficiency between HIGH and LOW levels of DDGS supplementation.

View the complete research report online at: ***www.asi.ksu.edu/cattlemensday***

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Effects of Optaflexx Alone or in Combination with BoVantage on the Performance and Carcass Merit of Finishing Heifers

This study is under further review.

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Utilization of Omega-3 Fatty Acids is Improved by Embedding Flaxseed in a Matrix of Dolomitic Lime Hydrate

Christian Alvarado Gilis

Objective: Evaluate feedlot performance of cattle fed finishing diets supplemented with ground flaxseed or flaxseed embedded within a matrix consisting of dolomitic lime hydrate.

Study Description: Crossbred heifers (454 heifers, 763 ± 44 lb) were blocked by weight and randomly assigned to dietary treatments consisting of a control diet without flaxseed; diets with 3 or 6% ground flaxseed; and diets with 2, 4, or 6% of a matrix consisting of 50% ground flaxseed and 50% dolomitic lime hydrate. Blood samples were taken from the jugular vein for analysis of long-chain fatty acid concentrations on day 29 of the study, and cattle were harvested after feeding for 140 to 168 days.

Results: Concentrations of alpha-linolenic acid, the primary omega-3 fatty acid in flaxseed, increased in response to feeding either source of flaxseed, and concentrations in blood plasma were directly proportional to the amount of flaxseed fed. Based on the comparative increases in blood concentrations in response to amounts fed, assimilation of omega-3 fatty acid from the lime-flaxseed matrix was approximately 42% greater that ground flaxseed alone, indicating a protective effect of the lime matrix. Feed intake and average daily gain decreased as the amount of hydrate:flaxseed mixture in the diet increased, but efficiency of feed utilization was not adversely affected.

Performance of heifers supplemented with ground flaxseed or ground flaxseed embedded in a matrix of dolomitic lime hydrate[1]

Item	Control	3% flax	6% flax	2% flax/ lime	4% flax/ lime	6% flax/ lime
Gain, lb/day	2.89[a]	2.94[a]	2.91[a]	2.86[a]	2.74[b]	2.42[c]
Dry matter intake, lb/day	19.7[a]	19.4[a]	19.4[a]	19.6[a]	18.6[b]	16.4[c]
Feed:gain	6.80	6.62	6.67	6.85	6.80	6.80
C18:3n3, ug/mL[2]	21.4[e]	146[c]	278[a]	72[d]	139[c]	208[b]

[1] A matrix consisting of 50% flaxseed and 50% dolomitic lime hydrate.
[2] Alpha linolenic aid (an omega-3 fatty acid) measured in blood plasma after 29 days on feed.
[a,b,c,d,e] Means in the same row without a common superscript letter are different, $P < 0.05$.

The Bottom Line: Encapsulating ground flaxseed in a matrix of dolomitic lime hydrate increased efficiency of omega-3 fatty acid assimilation by 42% compared with ground flaxseed, but levels greater than 2% of the diet can decrease feed intake and daily gain.

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Encapsulation of Flaxseed in a Dolomitic Lime Matrix: Effects on Feedlot Performance and Carcass Characteristics of Steers vs. Heifers

Geovani Feltrin

Objective: Compare feedlot performance and carcass characteristics of heifers and steers fed traditional finishing diets to those of cattle supplemented with encapsulated blends of ground flaxseed and dolomitic lime hydrate.

Study Description: Forty crossbred steers with an average initial body weight of 921 ± 57 lb and 40 crossbred heifers with an average initial body weight of 814 ± 62 lb were used in a randomized complete block design with a 2 × 4 factorial arrangement of treatments to evaluate the impact of feeding encapsulated blends consisting of dolomitic lime and ground flaxseed. Finishing diets consisted of: (1) Control (no flaxseed); (2) 4% of a 50:50 mixture of dolomitic lime and flaxseed; (3) 6% of a dolomitic hydrate flaxseed mixture containing 67% lime and 33% flaxseed; and (4) 6% of a 33:67 dolomitic hydrate:flax blend for the latter half of the finishing period (Late). Cattle were harvested after 116 or 144 days on feed, at which time liver abscess incidence rates and hot carcass weights were recorded. Carcasses were chilled for 24 hours, then graded.

Performance of heifers and steers

	Diets					*P*-value	
Item	Control	4% 50:50	6% 67:33	6% 67:33 late	SEM	Gender	Diet
Dry matter intake, lb/day							
Heifers	16.75[a]	14.90[b]	14.71[b]	14.77[b]	0.329	<0.01	<0.01
Steers	18.96[a]	17.02[b]	16.67[b]	17.57[c]	0.329		
Average daily gain, lb							
Heifers	2.60	2.45	2.49	2.36	0.121	0.03	0.18
Steers	3.31	3.06	2.98	3.00	0.121		
Feed:gain							
Heifers	6.44	6.08	5.90	6.25	0.008	0.16	0.28
Steers	5.72	5.56	5.59	5.86	0.008		

[a,b] Means in a row without a common superscript are different, $P < 0.05$.

The Bottom Line: Feeding flaxseed encapsulated with dolomitic lime decreased feed intake and carcass weight, and other measures of performance were consistent with changes in feed intake.

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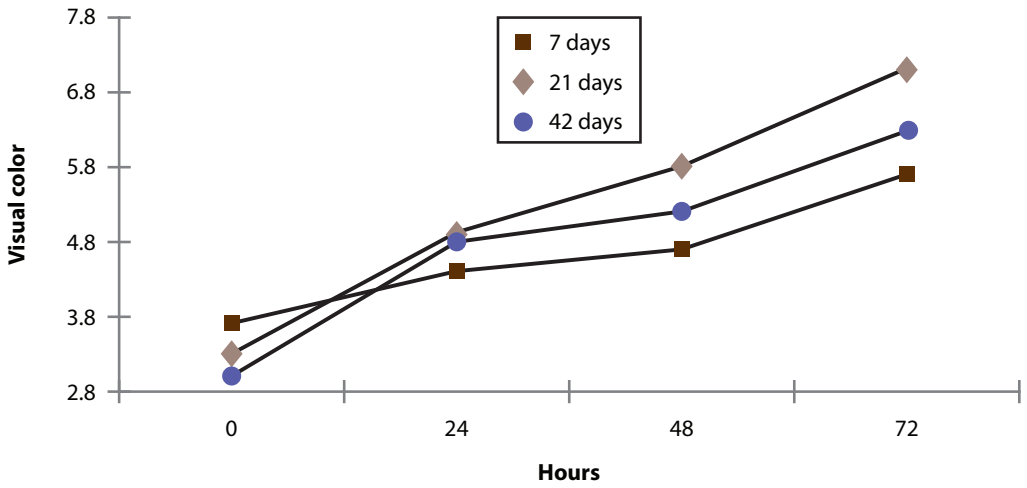
Aging Time Affects Color Stability and Sensory Properties of Ground Beef Patties Adjusted to a Similar Fat Composition by Combining Subprimals from the Chuck Roll and Knuckle

Brandy Cleveland

Objective: Determine effects of two quality grades (Premium Choice and Select) and pre-processing vacuum-storage aging time of 7, 21, and 42 days on ground beef patty display color from chuck roll and knuckle subprimals combined to obtain a common fat percentage.

Study Description: After aging for 7, 21, or 42 days, Premium Choice or Select knuckles and chuck rolls were ground and combined to achieve a similar fat content for each quality grade and aging time treatment. Ground beef patties were formed, placed in polyvinyl chloride–overwrapped trays, and displayed in a coffin-type retail case. Color was evaluated at 0, 24, 48, and 72 hours of display by a trained panel. Frozen, vacuum-packaged patties were thawed, cooked to 160°F, and evaluated for sensory and instrumental properties.



Aging time × display time interaction means for visual color (2 = bright cherry-red, 5 = slightly dark cherry-red, and 8 = extremely dark red) of ground beef patties (SE = 0.103)

The Bottom Line: As subprimal aging time is increased, ground beef patties deteriorate in color at a more rapid rate. Extended aging for 42 days results in more off-flavors, and instrumental measures indicate that aging increases tenderness and reduces hardness.

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Subprimal Type and Quality Grade Affect Fatty Acid Composition and Cooked Firmness of Ground Beef Patties

Carrie Garner

Objective: Determine the effects of two subprimal types (chuck roll and knuckle), two quality grades (Premium Choice and Select), and three vacuum-packaged storage aging times before processing (7, 21, and 42 days) on ground beef patty sensory properties.

Study Description: After aging for 7, 21, or 42 days, Premium Choice and Select knuckles and chuck rolls were ground twice before fatty acid analyses were conducted. Ground beef patties were formed, frozen, stored at -4°F until thawed, and cooked to an internal temperature of 160°F. A trained sensory panel was conducted, and instrumental properties (slice shear force, textural profile analysis, and Lee-Kramer shear) were evaluated.

Results: Patties from chuck roll subprimals had more total fatty acids (TFA), greater percentages of saturated fatty acids (SFA), and lower percentages of polyunsaturated fatty acids (PUFA) than those from knuckle subprimals. Patties from Premium Choice subprimals had more TFA, greater percentages of monounsaturated fatty acids (MUFA), and lower percentages of SFA and PUFA than those from Select subprimals. Overall, patties from fatter chuck roll and Premium Choice subprimals were softer (lower peak forces and hardness) than those from knuckle and Select subprimals. The sensory panel also observed that patties from chuck roll and Select subprimals were firmer.

The Bottom Line: Subprimal type and quality grade can affect fatty acid profiles. Ground beef patties from Premium Choice chuck rolls are softest in texture, whereas those from Select knuckle subprimals are the firmest.

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Aging Premium Choice Chuck Rolls for Minimal Days Maximizes Color Stability and Extends Retail Display Life

Carrie Garner

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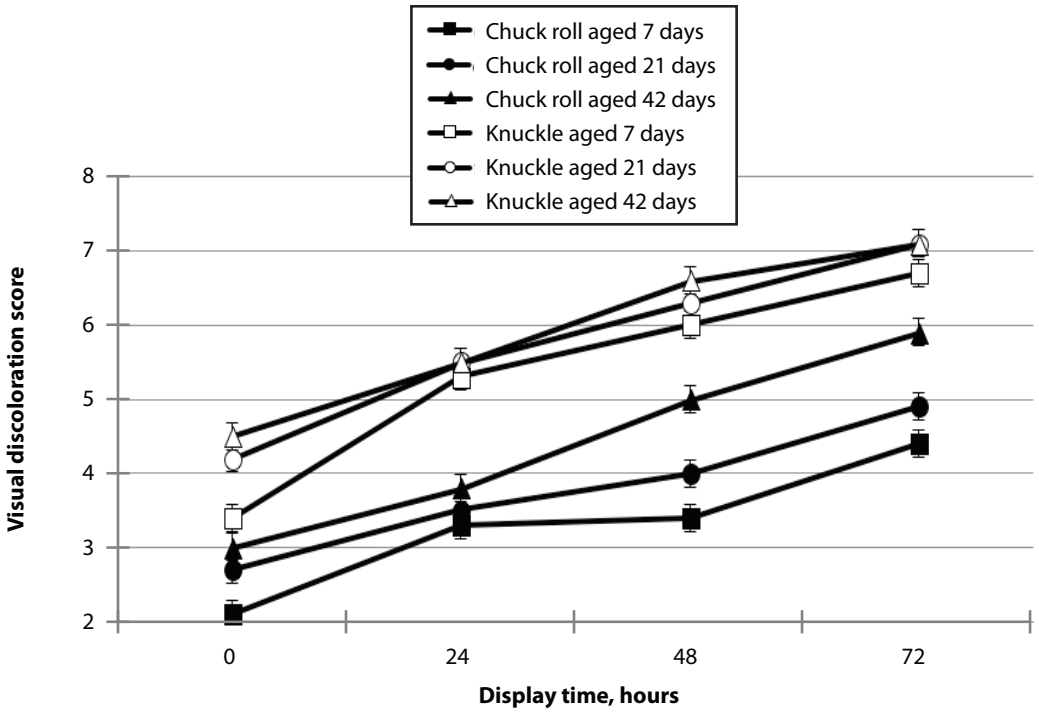
Objective: Determine the effects of two subprimal types (chuck roll and knuckle), two quality grades (Premium Choice and Select), and three vacuum-packaged storage aging times before processing (7, 21, and 42 days) on ground beef patty display color stability.

Study Description: After aging for 7, 21, or 42 days, Premium Choice and Select knuckles and chuck rolls were ground twice before proximate analyses were conducted. Ground beef patties were formed, packaged in polyvinyl chloride-overwrapped trays, and displayed in a coffin-type retail case at 36°F. Color was evaluated at 0, 24, 48, and 72 hours of display by a trained color panel and HunterLab MiniScan. At the beginning of display, ground beef patties were evaluated for microbial and lipid oxidation properties.

Results: Subprimal type × aging time × display time interaction means are depicted below for visual color discoloration scores (2 = bright red; 5 = moderately dark red; 8 = tan to brown) of ground beef patties (SE = 0.18).



The Bottom Line: Premium Choice chuck rolls aged for fewer than 21 days maximize color stability and extend retail display life. In contrast, patties from knuckle subprimals deteriorate rapidly, especially with extended aging times.

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Quality Classification Affects Firmness of Ground Beef Patties from the Chuck Roll

Emily Pownall

Objective: Determine the effects of three quality classifications and their combinations on ground beef patty display color stability and sensory attributes evaluated by both a trained sensory panel and consumer panel.

Study Description: Ground-beef patty treatments of Choice, Select, older maturity, 50% Choice/50% older maturity, and 50% Select/50% older maturity were produced from chuck rolls. Patties were formed, packaged in polyvinyl chloride–overwrapped trays, and displayed in a coffin-type retail case at 36°F. Color was evaluated at 0, 24, and 48 hours of display by a trained color panel and HunterLab MiniScan. A trained sensory panel, consumer panel, and slice shear force test were conducted on ground beef patties cooked to 160°F.

Results: No significant treatment differences were detected for percentage of fat, visual display color, or instrumental display color. Ground beef patties had the darkest, most discolored visual scores at 48 hours of display and the brightest red scores at 0 hours of display. Ground beef patties from the older maturity treatment were firmer and tougher than those from the Choice and Select treatments. Patties from the older maturity treatment had greater firmness and less tenderness as evaluated by a trained sensory panel, greater firmness as evaluated by a consumer panel, and greater slice shear force than those from the Choice and Select treatments.

The Bottom Line: With minimal differences in composition (fat percentage) and display color, patties from Choice and Select chuck rolls provided softer characteristics to the palate and instrumentally than those from older maturity chuck rolls.

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Increasing Postmortem Aging Time Decreases Color and Flavor Stability of Top Sirloin Steaks

Garret Dietz

Objective: Determine the color and flavor stability of beef top sirloin (*gluteus medius*) steaks subjected to extended aging and blade tenderization treatments and the biochemical factors responsible for any changes that may occur.

Study Description: After aging 5, 19, 33, 47, and 61 days, the top sirloin was removed from 15 top sirloin butts. The top sirloin was then cut into two pieces of equal size, which were then assigned to either blade tenderization or control with no mechanical tenderization. One-inch steaks were cut and assays were performed. Descriptive sensory analysis was conducted using a highly trained sensory analysis panel. A trained color panel evaluated steaks for initial color, display color, and discoloration.

Results: Aging and blade tenderization were effective in improving tenderness of top sirloin steaks. Aging decreased color stability of top sirloin steaks when steaks were evaluated in simulated retail display. The decreased color stability shown in this study was the result of decreased enzyme functionality. Lipid oxidation and warmed-over flavors increased in top sirloin steaks as aging time increased. Lactic acid bacterial growth also increased as aging time increased.

	Aging period (days)					
Trait	5	19	33	47	61	SEM
Warner-Bratzler shear force, lb	8.4[a]	6.8[b]	6.5[b]	6.3[b]	5.3[c]	0.26
Metmyoglobin reducing activity[1]	85.2[a]	73.3[b]	63.1[c]	71.2[b]	61.8[c]	3.78
Discoloration color panel[2]	2.7[d]	3.9[c]	4.4[b]	4.7[a]	4.6[a]	0.081
Warmed-over flavor[3]	1.8[b]	1.9[ab]	2.1[a]	2.1[a]	2.0[a]	0.48
Lipid oxidation [4]	0.07[c]	0.12[b]	0.15[b]	0.19[a]	0.19[a]	0.013

[1] Percentage metmyoglobin reduced.
[2] 1 = very bright red, 2 = bright red, 3 = dull red, 4 = slightly dark red, 5 = moderately dark red, 6 = dark red to dark reddish tan, 7 = tannish red, 8 = tan to brown.
[3] 15 = extremely strong, 0 = none.
[4] Thiobarbituric acid reactive substance, ppm malonaldehyde.

The Bottom Line: Postmortem aging and blade tenderization improve tenderness of top sirloin steaks; however, decreased color shelf life and increased warmed-over flavors should be expected in top sirloin steaks aged longer than 19 days.

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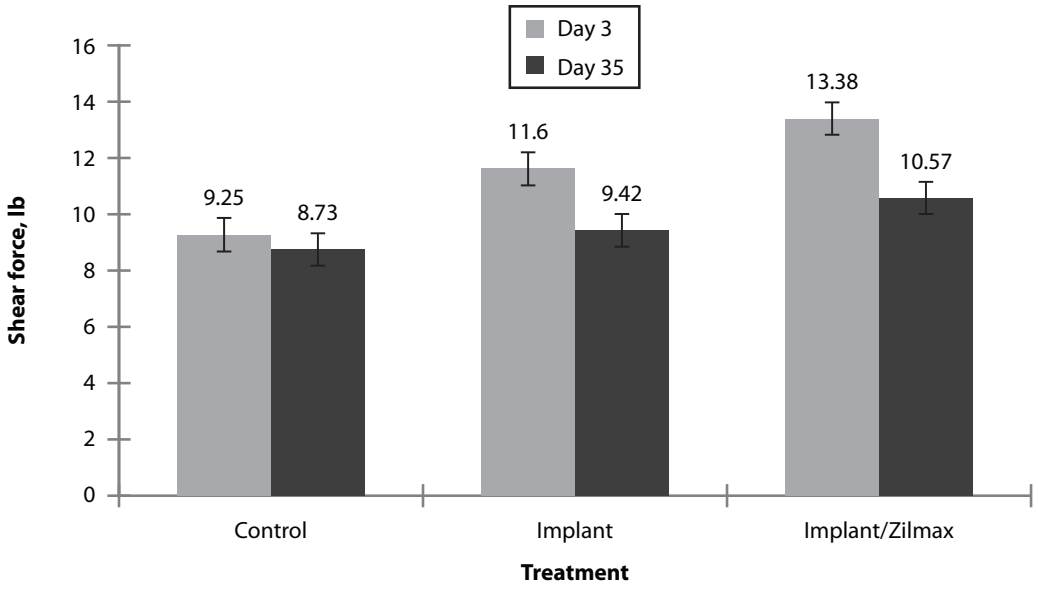
Aging for 35 Days Does Not Improve Tenderness of Strip Loin Steaks from Heifers Fed Zilmax

Sara Ebarb

Objective: The objective of this experiment was to examine the effects of implants (Component TE-200, Elanco Animal Health, Greenfield, IN) and Zilmax (Merck Animal Health, Summit, NJ) on meat tenderness across five aging periods as well as moisture retention during the cooking process.

Study Description: The study consisted of 33 crossbred heifers that were randomly assigned to three treatment groups: a control group (no implant/no Zilmax), an implant group, and an implant + Zilmax group. Feedlot and carcass performance was recorded for all animals. After slaughter, 1-in.-thick strip loin steaks were cut, vacuumed-packaged, and aged 3, 7, 14, 21, and 35 days at 33°F. Warner-Bratzler shear force and cook loss was measured on steaks cooked on an indoor-outdoor grill (Hamilton Beach, Southern Pines, NC).

Warner-Bratzler shear force for strip loin steaks aged 3 and 35 days and cooked to 158° F



The Bottom Line: As postmortem aging increases, Warner-Bratzler shear force of strip loin steaks will decrease but not eliminate the negative effects that implants and Zilmax have on postmortem tenderness.

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Electrostatic Spray Cabinet Evaluation to Verify Uniform Delivery of Chemical and Biological Solutions to Pre-Chilled Meat Animal Carcasses

Nicholas Sevart

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Objectives: Calibrate an electrostatic spray (ESS) cabinet, test the chemical deposition profile of the cabinet onto a meat carcass using fluorescent dye, and determine if the ESS cabinet could uniformly apply a biological inoculum to a carcass.

Study Description: Calibration of the cabinet was accomplished by testing and adjusting air pressure and fluid flow. A fluorescent dye test was conducted by spraying ~6.8 ounces of a dye solution onto a carcass side. A black light was used to observe dye deposition. An inoculation study used 6.3 quarts of non-pathogenic *E. coli* culture inoculum. Approximately 6.8 ounces of this inoculum was sprayed onto a pig carcass side. The carcass was sampled after a 30-minute microbial attachment period at eight anatomic locations.

ESS cabinet dimensions were 6 feet × 5.87 feet × 11.42 feet.

Results: The fluorescent dye was shown to cover all carcass surfaces in a highly uniform manner. The inoculation test showed a uniform recovery of ~5–6 log cfu/cm^2 (100,000 to 1 million bacteria) across all anatomic regions, except a slightly lower inoculum level at the top hock area.

The Bottom Line: ESS technology could reduce the volume of chemical antimicrobial sprays required in commercial carcass decontamination and could be used to inoculate a carcass uniformly to support future carcass intervention studies.

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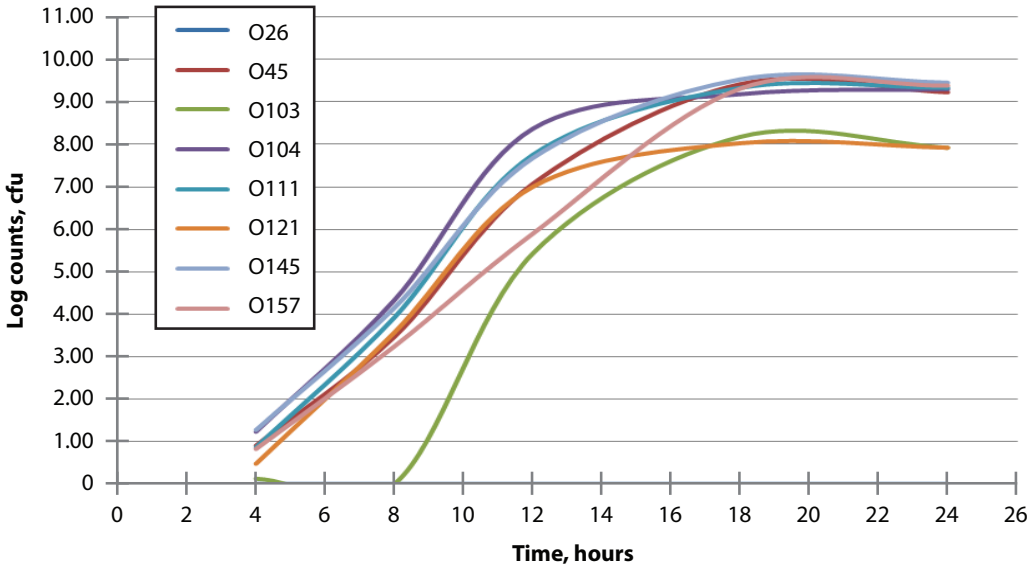
Effects of Media Type on Shiga Toxin-Producing *E. coli* Growth Patterns

Nicholas Baumann

Objective: Determine appropriate laboratory culture media for the selective growth and detection of serotypes of Shiga toxin-producing *Escherichia coli* (STEC) deemed to be adulterants in raw beef products.

Study Description: Eight STEC serotypes were individually inoculated into eight types of enrichment media, some of which had an antibiotic supplement. Growth at 99°F was evaluated over a 24-hour period. Aliquots of enrichments were removed at defined times and enumerated to establish the growth patterns of all media/strain combinations.

Results: Current enrichment methods utilize high to medium levels of novobiocin antibiotic to select for *E. coli* O157:H7 growth, but this antibiotic was shown to suppress the growth of many of the other STEC strains recently declared adulterants. The average log count (cfu) of *E. coli* O26, O45, O103, O111, O145, O157:H7, and O104:T4 enriched using *E. coli* broth at 99°F for up to 24 hours and then plated on tryptic soy agar for enumeration are shown in the figure below.



The Bottom Line: *Escherichia coli* broth with no antibiotic addition was determined to be the best selective enrichment medium for STEC analyses to determine presence or absence of STEC in laboratory samples.

Beef Cattle Research

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BEEF CATTLE RESEARCH

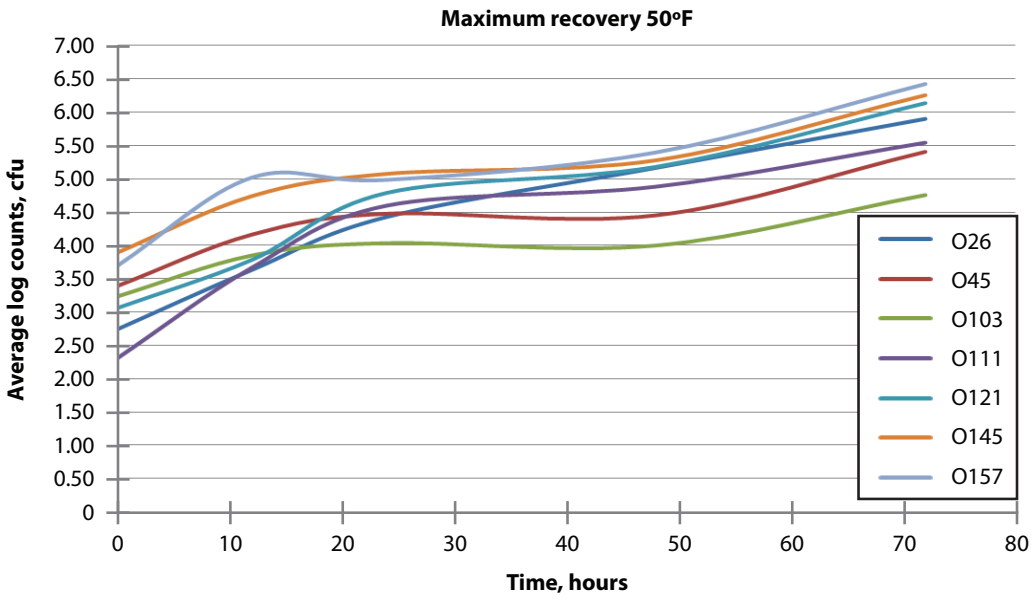
Evaluating the Effectiveness of Transport Media on Shiga Toxin-Producing *E. coli* Serotypes

Nicholas Baumann

Objective: Evaluate the ability of three common culture media types used to transport field-based samples for laboratory determination of Shiga toxin-producing *E. coli* (STEC) levels and viability. The goal was to identify which transport medium maintained STEC levels at or near original inoculation levels.

Study Description: Three different culture media types including buffered peptone water, Cary-Blair transport media, and maximum recovery diluent were inoculated with seven strains of STEC and placed in refrigerators at either 39°F or 50°F to simulate possible conditions during sample shipment from the field to an analytical laboratory. The media were sampled at 0, 12, 24, 48, and 72 hours and the results compared.

Results: Although the media types showed little variation at 39°F, at 50°F the Cary-Blair transport media demonstrated the best ability to maintain the STEC population at original inoculation levels.



The Bottom Line: Using Cary-Blair transport media with proper refrigeration temperatures will enable gathering and shipping of environmental and beef samples to analytical laboratories with reduced likelihood of STEC level fluctuations and allow quantitative STEC measurements to be made to support research and regulatory programs in the meat industry.

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BEEF CATTLE RESEARCH

Comparison of Conventional and Alltech Beef PN Finishing Programs: Meat Color Characteristics

Kelsey Phelps

Objective: Compare the effects of the Alltech PN Feed Program to a conventional diet on fresh meat retail shelf life color when both diets were fed with or without growth promotants.

Study Description: Five hundred twelve crossbred steers were fed for 175 days to test two effects. Steers were assigned to either a conventional finishing diet or a diet using the Alltech PN Receiver and Finisher supplements (Alltech, Inc., Nicholasville, KY). Both diets were fed with or without the use of implants and Optaflexx (Elanco Animal Health, Greenfield, IN). Animals were harvested after 175 days, strip loins were collected 24 hours later, and analyses were conducted after 14 days of aging.

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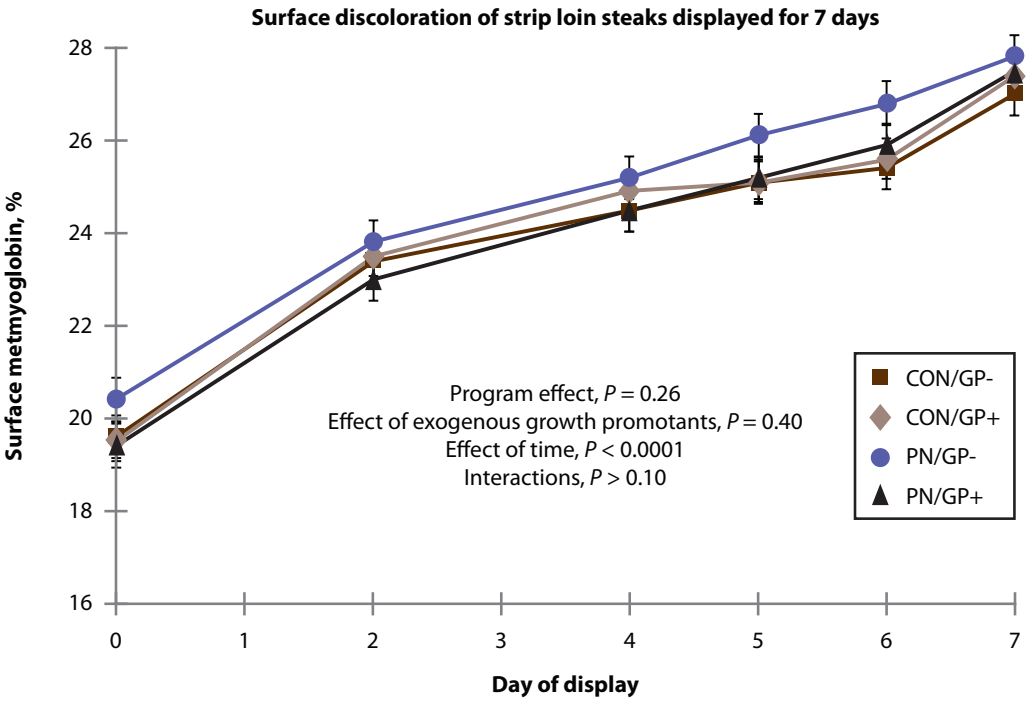

The Bottom Line: Replacing conventional feed supplements with Alltech PN supplements minimally impacts meat color characteristics.

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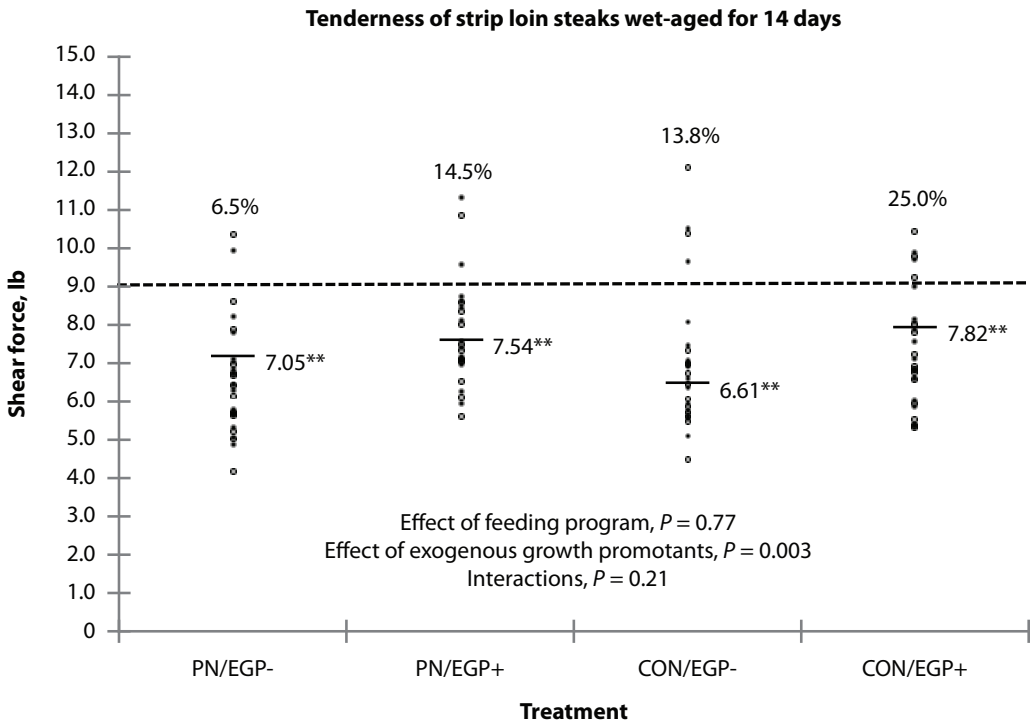
Comparison of Conventional and Alltech Beef PN Finishing Programs: Meat Water-Holding Capacity and Tenderness

Kelsey Phelps

Objective: The objective of this study was to compare the fresh cooked meat quality of the Alltech PN Beef Program to a conventional feedlot diet when these diets are used alone or in combination with exogenous growth promotants.

Study Description: Five hundred twelve crossbred steers were fed for 175 days to test two effects. Steers were assigned to either a conventional finishing diet or a diet using the Alltech PN Receiver and Finisher supplements (Alltech, Nicholasville, KY). Both diets were fed with or without the use of implants and Optaflexx (Elanco Animal Health, Greenfield, IN). Animals were harvested after 175 days, loins were collected 24 hours later, and analyses were conducted after 14 days of aging.



The Bottom Line: Alltech PN supplements favorably affected meat water holding capacity, but use of exogenous growth promotants decreased water-holding capacity and tenderness.

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Cattlemen's Day 2014

Beef Cattle Research

Summary Publication

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