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## G12-425 Nebraska Beef Report Summaries 2012

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## Nebraska Beef Report Summaries 2012

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Brief synopses of recent UNL beef research.

### Introduction

Each year the UNL Department of Animal Science reports its current beef cattle research. More detailed reports are available in the *2012 Nebraska Beef Report*, available in print from University of Nebraska–Lincoln Extension or on the Web at <http://www.ianrpubs.unl.edu/sendIt/mp95.pdf> or <http://beef.unl.edu>.

### Cow/Calf

**Supplementing Gestating Beef Cows Grazing Cornstalk Residue.** A five-year study evaluated the effects of protein supplementation to beef cows grazing cornstalks in late gestation. Supplementation improved cow BCS at end of cornstalk grazing. Calf weight, pregnancy rates, and reproductive traits of subsequent heifer progeny were not impacted by supplementation of the dam while grazing cornstalks.

**Effect of Cornstalk Grazing and Baling on Cattle Performance and Irrigation Needs.** The effects of removing corn residue on continuous corn production were investigated. Initial data showed a trend of more water in the soil in treatments with more residue left on the field (no grazing or baling), but there was no effect of either grazing or baling on subsequent corn yield.

**Nutritive Value and Amount of Corn Plant Parts.** Corn plants were separated into seven different plant parts and analyzed for digestibility. Digestibility of the different parts ranged from 33.85–59.03%. The amount of highly digestible residue averaged 13.4 lb/bu of grain. Subsequent crop yields were not affected by grazing.

**Wheat Straw, Distillers Grains, and Beet Pulp for Late Gestation Beef Cows.** Feeding value of wet distillers grains:wheat straw or wet distillers grains:beet pulp:wheat straw mixtures for gestating beef cows was estimated. Cows limit fed distillers grains and wheat straw gained as much BW and BCS as cows limit fed alfalfa hay. In another experiment, cows fed wet distillers grains and wheat straw or wet distillers grains, beet pulp, and wheat straw gained more BW and improved BCS compared to cows fed alfalfa hay.

**Influence of Weaning Date and Parturition Nutrition on Cow-Calf Productivity.** October weaned cows had greater average BCS and BW compared to December weaned cows; however, the level of supplementation on winter range did not impact BCS or BW. Subsequent pregnancy rates were not influenced by weaning date or any winter treatments. Steer progeny showed no differences in feedlot entry BW, final BW, DMI, ADG, or carcass characteristics. No differences in per-

centage cycling before breeding or in pregnancy rates of heifer progeny were observed.

**Effect of Calving Period on Heifer Progeny.** The effect of calving date on ADG, reproduction, and first-calf characteristics in spring born heifer calves at Gudmundsen Sandhills Laboratory were evaluated. Heifer calves born during the first 21 days had greater weaning, pre-breeding, and pre-calving BW; greater percentage cycling before breeding and pregnancy rates compared to heifers born in the third 21-day period. First-calf progeny had earlier birth date and greater weaning BW.

**Evaluating Conventional and Sexed Semen in a Commercial Beef Heifer Program.** Heifers were AI with one of two sires, either conventional or sexed semen, creating four possibilities for AI sire. Pregnancy rate was greater for conventional than sexed semen. More heifers detected in estrus were pregnant than heifers time AI. Further research is needed to establish the optimum estrous synchronization program with sexed semen.

**Late Gestation Supplementation Impacts Primiparous Beef Heifers and Progeny.** Heifers from HIGH and LOW rumen undegradable protein (RUP) groups had greater final BW, DMI, ADG, and G:F compared to CON heifers. Calves from HIGH dams had greater pre-breeding BW, and LOW calves had greater weaning BW compared to CON calves. Feedlot initial BW was greater for HIGH and LOW calves compared to CON calves. However, final BW and carcass characteristics were similar among treatments.

**Nutritional Regime and Antral Follicle Count Impact Reproductive Characteristics in Heifers.** Developing heifers were offered either a modified distillers (MOD), distillers based (DDG), or a corn gluten feed based (CGF) supplement. Heifers developed on MOD diets had greater reproductive tract score, ovarian area, and total antral follicle count (AFC) compared to DDG and CGF heifers. Heifers developed on DDG and CGF had greater overall pregnancy rates compared to MOD heifers. A positive relationship between AFC and small and medium follicle counts was observed.

**Vascular Endothelial Growth Factor A (VEGFA) in Ovulatory Follicles.** Granulosa cells express vascular endothelial growth factor A (VEGFA), and VEGFA mRNA levels increase as bovine follicles reach preovulatory status. Higher mRNA levels for the antiangiogenic isoform, VEGFA<sub>164B</sub>, along with AMH and CARTPT in E2-inactive follicles suggest these factors are markers for unhealthy, atretic follicles. In contrast, higher mRNA levels for proangiogenic isoform, VEGFA<sub>164</sub>, in E2-active follicles indicate this isoform may help predict healthy ovulatory follicles.

**Oocyte mRNA and Follicle Androgen Levels Associated with Fertility.** Androgen levels within the follicle were higher in heifers that never established a pregnancy compared to cows

that stayed in the herd at least three years and had at least one successful pregnancy. These high androgen levels were associated with increased abundance of several candidate mRNAs in the cumulus-oocyte complex (COC), which includes oocyte and somatic cells immediately surrounding the oocyte, isolated from the dominant follicle.

**The Simmental Breed: Population Structure and Generation Interval Trends.** Pedigree structure and changes in generation intervals over time within the Simmental breed were studied. The number of breeders that accounted for 10% of sires of sires, sires of dams, dams of sires, and dams of dams were 3, 5, 5, and 16, respectively. States with the greatest influence on four pathways of selection included Montana, South Dakota, Kansas, and Texas. Generation intervals for the four pathways decreased by year of birth over the time span of the data analyzed. Average generation intervals for sires and dams also decreased by year of birth, while animals increased slightly.

**Association of Myostatin on Performance and Carcass Traits in Crossbred Cattle.** Homozygous inactive steers had similar ADG, lower DMI, and lower F:G when compared to steers influenced by active myostatin. Steers and heifers with inactive myostatin showed similar trends in carcass traits producing larger LM area, greater dressing percentages, and leaner carcasses. Similar ADG, lower DMI, and improved F:G were observed for homozygous inactive compared to homozygous active steers.

**Economic Analysis of Keeping a Nonpregnant Cow.** Five-year cash flow budgets developed in this study suggest in some circumstances it is economically feasible to keep a nonpregnant cow.

**Effect of Post-Weaning Heifer Development System on ADG, Reproduction, and Adaptation to Corn Residue During First Pregnancy.** Weaned heifers were assigned to a development system: (1) graze corn residue then winter range, (2) graze winter range, or (3) graze winter range then placed in drylot. Pregnant heifers were assigned to one of three corn residue fields in late gestation based on previous heifer development. Weaned heifers developed on corn residue had similar BW and ADG during winter grazing and after breeding compared to heifers developed on winter range. Effect of post-weaning management on reproductive performance was similar for all heifer treatments.

**Impact of Post-Weaning Beef Heifer Development System on ADG, Reproduction, and F:G.** After weaning, heifers were developed on one of two winter grazing systems: corn residue (CR) followed by winter range, or winter range followed by drylot (DL). Heifer BW was greater for DL heifers prior to breeding, at breeding, and prior to first parturition. There were no differences in reproductive performance despite CR heifers having lower BW at breeding. Feed efficiency was similar during late gestation between CR and DL heifers.

**Heifer Development: Think Profit, Not Just Cost or Revenues.** A modified profit function demonstrated differences among three measures. In optimizing pregnancy rates, a heifer must be heavier to optimize productivity as measured by revenue verses profit. Similarly in the case of cost minimization, reduction in developmental expenses results in less profit except when the economically optimal-sized heifer equals that of the size chosen to cost minimize.

**Beef Heifer Development and Profitability.** Physical and economic relationships were combined into a bioeconomic systems model that identified key profit factors. This system-wide approach encapsulated physical relationships with relevant costs and revenues, including annual and seasonal variations and measures relative to profitability through application of an incomplete or modified profit function. Optimal outcomes were relative to heifer size and management regime.

## Growing

**Research Results are Dependent on Accurate Cattle Weights.** Cattle grazing cornstalks, smooth brome grass pasture, or in a drylot and fed a forage and modified distillers grains mix were limit fed for at least three days and then weighed on two or three consecutive days to obtain a beginning BW. Full weights of individuals were +99 to -86 lb compared to their limit fed weights. The correlation between two-day weights after limit feeding were greater ( $r = 0.9$ ), and greater than correlation between full and limit fed weights.

**Forage Availability and Quality of No-till Forage Crops for Grazing Cattle.** No-till forage crops were evaluated using different mixtures containing forage peas, oats, winter triticale, turnips, radishes, clover, vetch, and sunflower. Mixtures containing forage peas and oats yielded greatest quantity of DM/acre. NDF and CP content of the mixtures were comparable to native range during the growing season.

**Strategies of Supplementing Dried Distillers Grains to Yearling Steers on Smooth Brome grass Pastures.** Steers supplemented with dried distillers grains with solubles (DDGS) daily on nonfertilized smooth brome grass pastures gained 0.55 lb/day more than cattle on nonsupplemented treatments. Steers supplemented at 0.6% BW DDGS gained 2.59 lb/day compared to 2.36 lb/day for steers fed a similar total amount of DDGS at increasing levels over the growing season.

**Comparison of Feeding Dry Distillers Grains in a Bunk or on the Ground to Cattle Grazing Subirrigated Meadow.** Steers fed in a bunk had greater ADG than steers fed on the ground (1.19 vs. 0.92 lb). For steers fed in a bunk, a reduction in estimated DDGS intake between 0.8 and 0.9 lb/day would have resulted in a 0.27 lb/day reduction in ADG, which means 36-41% of the DDGS fed on the ground was wasted.

**Byproducts with Low Quality Forage to Grazing Cattle.** Cows grazing smooth brome grass pasture were unsupplemented or supplemented a Synergy:straw mixture. Grazed forage intake was replaced with supplementation, with no differences in cow performance. Yearling steers grazing native range were fed a mixture of hay:WDGS or straw:WDGS. The first year, all steers fed byproduct-forage mixtures had greater ADG than control steers. The second year, steers supplemented with byproduct-hay mixtures had similar gains as control while steers supplemented byproduct-straw mixtures gained less.

**Effects of Forage Type, Storage Method, and Moisture Level in Crop Residues Mixed with Modified Distillers Grains.** Diets consisting of cornstalks or wheat straw (50% and 70%) and modified distillers grains were compared at different moisture levels when ensiled or mixed daily. Steers fed ensiled diets had greater DMI compared to diets mixed daily. Moisture level and crop residue type had no effect on steer performance. In Experiment 2, moisture level had no effect, and cornstalks were consumed better than wheat straw. Steers fed freshly mixed diets gained more and were more efficient than those fed ensiled mixes.

**Effect of Storage Method on Nutrient Composition and Dry Matter Loss of Wet Distillers Grains.** Six cover treatments were evaluated when wet distillers grains plus solubles (WDGS) and straw were stored, or modified distillers grains plus solubles (MDGS) alone was stored for 60 days in 55-gallon barrels. Covering with plastic minimized spoilage (8%), and plastic or soluble used as a cover decreased DM loss (3-5%). Barrels filled with WDGS alone and uncovered were evaluated over 140 days of storage. With time, DM loss and spoilage increased.

**Spoilage of Wet Distillers Grains Plus Solubles and Feed Value.** Performance of growing or finishing steers fed wet distillers grains plus solubles (WDGS) from a silo bag (nonspoiled) or bunker (spoiled) was studied. Spoiled WDGS

lost DM, as well as decreased in fat, NDF, and CP. The spoiled WDGS had no effect on finishing cattle performance, but it did affect DMI of the growing steers consuming high forage diets.

## Finishing

**Increasing Levels of Condensed Distillers Solubles and Finishing Performance.** Effects of adding 0, 9, 18, 27, or 36% condensed corn distillers solubles (CDS) to finishing diets containing a blend of dry-rolled and high-moisture corn and no other byproducts were evaluated. As CDS replaced corn, DMI decreased linearly, while ADG and F:G increased quadratically. Dietary inclusion of CDS to maximize ADG was 20.8% and was best for F:G at 32.5% for minimal F:G.

**Wet Distillers Grains and Ratios of Steam-Flaked and Dry-Rolled Corn.** Feeding ratios of dry-rolled corn (DRC) and steam-flaked corn (SFC) in diets containing 0 or 35% wet distillers grains plus solubles (WDGS) were evaluated. As SFC replaced DRC in diets containing no WDGS, F:G improved. Varying SFC and DRC ratio in diets containing 35% WDGS did not impact F:G. Feeding WDGS increased hot carcass weight and fat depth while feeding different ratios of corn impacted marbling deposition.

**Feeding Condensed Distillers Solubles in Finishing Diets Containing WDGS or Synergy.** Effects of adding 0, 7, 14, or 21% condensed distillers solubles (CDS) to diets containing either 20% modified distillers grains (MDGS) or 20% Synergy were evaluated. A byproduct by CDS level interaction was observed for final BW, hot carcass weight, and ADG. Cattle fed Synergy had greater DMI than cattle fed MDGS. In MDGS diets at 14% CDS and in Synergy diets at 21% CDS, ADG was maximized. Increasing CDS level in both types of diets improved F:G linearly.

**Feeding Field Peas in Finishing Diets Containing Wet Distillers Grains Plus Solubles.** Feeding 0 or 20% field peas in dry-rolled corn-based diets with 0 or 30% wet distillers grains plus solubles was evaluated. WDGS had no effect in diets without peas but increased DMI in diets containing peas. Peas decreased DMI in diets with no WDGS but had no effect on DMI in diets containing WDGS. WDGS decreased F:G in diets without peas, but had no impact in diets containing peas. Field pea inclusion decreased F:G in diets with no WDGS but increased F:G when WDGS was present.

**Effect of Corn Processing on Feedlot Steers Fed Sugarbeet Pulp.** Impact of feeding three levels of beet pulp with either dry-rolled corn or steam-flaked corn (SFC) in feedlot rations was evaluated. Final BW, DMI, and ADG decreased linearly as beet pulp replaced corn. Beet pulp linearly decreased HCW, 12th rib fat, and YG. Corn processing had no impact on carcass characteristics. Feeding SFC improved F:G, compared to feeding DRC. The inclusion of beet pulp in the diet did not impact F:G.

**Distillers Grains With Solubles and Ground Ear Corn in Feedlot Diets.** Steers fed the highest level of DGS (37.5% of diet DM) with ground high-moisture ear corn had the lowest ADG and DMI, but F:G tended to be improved by feeding 25% and 37.5% DGS with ear corn as compared with feeding rolled corn plus corn silage. Feed cost of gain (COG) and total COG was most favorable (4.4% lower than control) for cattle fed 25% DGS plus 35% ear corn diet.

**Metabolism of Finishing Diets Containing Condensed Distillers Solubles and WDGS.** A metabolism study evaluated effects of wet distillers grains (WDGS) and condensed distillers solubles (CDS), both separately and in combination. Diet had no impact on nutrient digestibility. Average ruminal pH was lower for steers fed CDS than for those fed WDGS alone. Steers fed WDGS spent less time below pH 5.6 than steers fed diets with no WDGS. Inclusion of CDS decreased ruminal acetate

concentration and acetate to propionate ratio compared to diets with less or no CDS.

**Ruminal Degradable Sulfur and Hydrogen Sulfide in Cattle Finishing Diets.** Steers were fed diets containing organic, inorganic, and wet distillers grains with solubles as sources of sulfur. A laboratory procedure was developed to measure ruminal degradable sulfur (RDS) of ingredients. Intake of RDS explained 65% of ruminal hydrogen sulfide concentration variation, whereas total sulfur intake and ruminal pH, individually, explained 29% and 12%, respectively.

**Meta-Analysis of the Effect of Dietary Sulfur on Feedlot Health.** For a given level of dietary sulfur the relative risk for polioencephalomalacia (PEM) decreased as forage NDF increased. Rumen degradable sulfur (RDS) was estimated for feedstuffs fed to cattle included in the analysis. As level of RDS increased in the diet, incidence of PEM increased. RDS is a better measure of PEM risk because it accounts for the dietary sulfur that contributes to hydrogen sulfide production.

**Complete-feed diet RAMP™ in Grain Adaptation Programs.** Cattle were adapted to a common finishing diet over 22 days by decreasing RAMP (100-0%) and increasing finisher (0-100%) either as a blend in a traditional grain adaptation system or a two-ration program. Steers adapted using RAMP were more efficient than traditionally adapted cattle. Using RAMP as an ingredient improved ADG compared to traditional grain adaptation.

**Use of Complete-feed Diets RAMP™ and Test Starter for Receiving Cattle.** Newly arrived steer calves were fed one of two complete feeds: RAMP and Test Starter which contained a high level of Sweet Bran® and a minimal amount of forage. RAMP increased ADG when compared with the control diet. Cattle fed Test Starter had similar performance to the control receiving diet.

**Effects of RAMP™ on Feed Intake and Ruminal pH During Adaptation to Finishing Diets.** A metabolism trial was conducted using an adaption strategy where RAMP inclusion was decreased (100 to 0%) while increasing inclusion in the finishing ration (0 to 100%) was compared to a traditional adaption (Control) where alfalfa hay inclusion was decreased (45 to 7.5%) while increasing corn. Adapting cattle with RAMP increased DMI, had no effect on average pH, pH variance, or magnitude of change compared to Control.

**Potassium for Feedlot Cattle Exposed to Heat Stress.** Cattle fed diets supplemented with potassium (K) carbonate had lower ADG and tended to have decreased water intake, G:F, and dressing percentage. Cattle fed diets supplemented with K with or without whole soybeans had lower or tended to have lower tympanic temperatures than control cattle during the hottest portion of the day.

**Feeding Modified Distillers Grains With Solubles and Wet Corn Gluten Feed (Synergy) to Adapt Cattle to Finishing Diets.** Adapting steers by decreasing alfalfa (CON) or decreasing a combination of distillers grains and corn gluten feed (SYNERGY) followed by feeding a common finishing diet to slaughter were compared. Performance and carcass traits did not differ between adaptation systems.

**Using Beet Pulp to Adapt Cattle to Finishing Diets.** A low beet pulp (BP) treatment and a high BP treatment were compared. Adapting cattle with high BP tended to decrease DMI during adaptation. Both BP adaptation programs increased ADG over the entire feeding period. Replacing up to 50% of alfalfa hay with BP during grain adaptation had no impact on F:G or carcass traits and increased ADG.

**Effect on Performance and Nutrient Mass Balance of Feeding Micro-Aid in Wet Distillers Grains Plus Solubles Diets.** In a WINTER experiment, cattle fed Micro-Aid had a greater amount of OM and DM removed in manure. Micro-Aid

increased amount of manure N and decreased N losses in the WINTER. There was no difference in N removed in manure or lost via volatilization in the SUMMER experiment.

**Effects of Barley Diets with Distillers Grains Plus Solubles on Feedlot Performance and N and P Balance.** Four treatments (0 or 20% DDGS and LOW or HIGH starch:NDF barley) were evaluated in a commercial feed yard in Alberta, Canada. Feeding LOW starch:NDF barley improved feedlot performance and increased N retention. Feeding 20% DDGS increased DMI, had a slight negative impact on F:G, and increased N and P losses.

**Feedlot Manure Utilization as Influenced by Application Scheme and Diet.** The BFNMP\$ program was utilized to study economics of manure utilization. Feeding high CP (18.7%) and P (0.5%) diets increased manure net value \$6.92/head compared to manure when a traditional diet (13.3% CP and 0.3% P) was fed.

**Chemical Treatment of Low-quality Forages to Replace Corn in Cattle Finishing Diets.** Corn stover, corn cobs, and wheat straw were alkaline treated at 50% moisture or fed without chemical treatment at 20% inclusion. Chemical treatment of forage improved performance compared to untreated. Compared to control diets, treated diets had similar performance and carcass merit. Economic analysis revealed \$6.46, \$21.42, and \$36.30 average profit per head advantage for diets containing treated residues relative to control with corn was priced at \$3.00, \$4.50, and \$6.00 per bushel, respectively.

**Reducing Particle Size Enhances Chemical Treatment in Finishing Diets.** Treated stover diets improved ADG and F:G compared to untreated. Reducing particle size (1-inch or 3-inch screen) improved ADG and F:G but did not influence DMI. Compared to a control diet with 5% roughage and 15 percentage units more corn, diets with 20% treated corn stover had similar F:G, ADG, DMI, and carcass quality.

**Factors Influencing Profitability of Calf-Fed Steers Harvested at Optimum Endpoint.** Profitability was evaluated on a live weight basis assuming \$112/cwt selling price and \$180/cwt dressed price. Profit was compared as corn price and Choice-Select spread increased. Overall, carcass weight was the dominant factor in determining profitability. However, at \$7 corn, F:G had the most influence on profit. Yield grade decreased and marbling score increased in importance as Choice-Select spread increased.

**Grazing Supplementation and Subsequent Feedlot Sorting of Yearling Cattle.** Steers fed (0.6% BW) modified distillers grains plus solubles on the ground had increased ADG and BW at the end of summer grazing and were more profitable. Supplemented steers were fed 24 fewer days to reach feedlot harvest goal, had greater LM area, and lower marbling. Steers sorted on feedlot entry BW had increased HCW, marbling, and YG, but percentage overweight carcasses and profitability were similar. Steers supplemented during summer grazing had \$11.80/animal greater overall profit.

**Impact of Sorting Prior to Feeding Zilpaterol Hydrochloride on Feedlot Steers.** Unsorted (–CON), unsorted Zilmax (+CON), and three treatments fed Zilmax where the heaviest 20% of steers within the pen were identified at beginning (EARLY), 100 days from harvest (MIDDLE), or 50 days from harvest (LATE) and marketed 28 days earlier were compared. Dry matter intake was not different. Gain and G:F were improved by feeding Zilmax. Carcasses from the +CON and steers sorted EARLY, MIDDLE, and LATE were 29, 61, 56, and 53 lb heavier than –CON, respectively. Fat depth and marbling were lower for

+CON compared to –CON, but feeding Zilmax with any of the sorting treatments improved marbling to equal –CON.

## Beef Products

**Condensed Distillers Solubles and Beef Shelf Life.** Condensed distillers solubles were fed to cattle at 0, 9, 18, 27, or 36% inclusion rates. There were no effects on objective steak color, subjective discoloration, Warner-Bratzler shear force, moisture content, fat content, or oxidation values. Diet did not affect polyunsaturated fatty acid levels in meat, but the control diet had higher total unsaturated fatty acids and monounsaturated fatty acids than all other treatments.

**Effects of Antioxidants on Beef in Low and High Oxygen Packages.** Application of tertiary butyl hydroquinone on steaks prior packaging (either in low- or high-oxygen modified atmosphere packages) was significantly effective in minimizing color and lipid oxidation during retail display. Under modified atmosphere packaging (low- or high-oxygen modified atmosphere packaging), oxidation of myoglobin color pigments and lipids were unrelated to beef tenderness.

**Dietary Antioxidants and Beef Tenderness During Retail Display in High O<sub>2</sub>.** Aged (8 and 29 days) strip loins, from crossbred steers fed dry-rolled corn-based finishing diets containing 0 or 30% wet distillers grains with a synthetic antioxidant blend (AGRADO® PLUS) were packaged in high-oxygen modified atmosphere packages (80% O<sub>2</sub>:20% CO<sub>2</sub>). Steaks aged longer and packaged in high-oxygen modified atmosphere packages decreased in tenderness. Feeding AGRADO PLUS tended to decrease tenderness and increase protein oxidation during retail display under high-oxygen conditions.

**Effects of Freezing and Thawing Rates on Tenderness and Sensory Quality of Beef Subprimals.** Beef ribeye rolls, strip loins, and top sirloin butts were aged for 14 days and then blast or conventionally frozen and slow or fast thawed, or were fresh, never frozen and aged for 14 days or 21 days. Thawing method affected purge loss and tenderness, and freezing method had a minimal effect. Neither freezing nor thawing methods had an effect on sensory tenderness and minimal effects on the other sensory attributes.

**Subprimal Freezing and Thawing Rates Affect Beef at Retail.** Ribeye, strip loin, and sirloin subprimals were either fast or slow frozen and then fast or slow thawed. Thaw purge loss was higher for slow-thawed subprimals with fast-thawed product having the greatest purge loss during display. Color data indicated frozen-thawed beef subprimals are comparable to fresh, never frozen subprimals in color stability during day 1-4 of retail display. Total purge loss was increased for slow-thawed subprimals, and freezing rate had minimal effects on retail quality.

**This publication has been peer reviewed.**

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