quantitative RT-PCR. In parallel, blood serum metabolite levels were measured; proteins were localized by immunohistochemistry. Relative mRNA levels of the lipid efflux transporters ABCA1 and ABCA7 were elevated during involution as compared to lactation (P=0.0197, <0.0001, resp.). The intracellular cholesterol transporter NPC1 and the regulatory genes LXRα, PPARγ, SREBP1, SREBP2 were increased post partum as compared to the dry period (P=0.0003, 0.0271, <0.0001, 0.038 resp.). Correlation analysis of ABCA1, ABCA7 and ABCG1 mRNA profiles with blood cholesterol levels revealed significant inverse relationships (r=-0.39, -0.51, -0.29, resp.; P<0.05). ABCA1 and ABCG1 showed differential localization and activity in mammary epithelial cells (MEC) during involution and lactation. This study demonstrates that lipid transporters and their regulatory genes are differentially expressed in the MG during the pregnancy-lactation cycle and correlate with blood serum cholesterol profiles. Our results suggest that ABCA1 and ABCG1 are involved in the removal of cholesterol from MEC. ABCA7 may play a role in phagocytosis of apoptotic MEC during involution. Regulation of lipid transporters in the MG is only partially associated with transcription factors that control lipid homeostasis because the induction of lactation is triggered by lactogenic hormones that may interfere with regulators of lipid homeostasis.

Key Words: ABC transporters, cholesterol, mammary gland

Meat Science and Muscle Biology: Symposium: Effects of By-product Feeding on Meat Quality Traits

326 Effects of feeding distillers grains on fat deposition in feedlot cattle. B. A. Casey*, S. R. Rust, and J. P. Grobbel, *Michigan State University*, *East Lansing*.

The objective of this study was to evaluate the effects of modified wet distillers grains with solubles (MDGS) on partitioning of fat between various depots. Crossbred cattle (n = 168) were used in a randomized complete block design with 7 pens per treatment. Treatments consisted of 0, 20, or 40% (DM basis) MDGS, as a replacement for high-moisture corn in the basal diet. The basal diet consisted of 83% high moisture corn, 12% corn silage, and 5% protein-mineral supplement. Ultrasound scans were taken every 56 d throughout the study to estimate intramuscular fat (IMF) and subcutaneous fat deposition. Cattle were fed for 139 d and harvested when 12th rib fat thickness (SQF) was estimated to be 1.01 cm. Performance and carcass data was evaluated. Final weight was calculated by adjusting carcass weights to a constant dressing percent. The subsequent weight was used to calculate ADG. Shrunk dressing percent was calculated by adjusting live weights to 4% shrink. Inclusion of MDGS had no effect on DMI, however carcass adjusted G:F tended to increase (P = 0.08) with the inclusion of MDGS in the diet. The inclusion rate of 20 and 40% MDGS tended to increase shrunk dressing percent (P = 0.09) and yield grade (P = 0.06) when compared to the control diet. The ratio of IMF:SQF (IMR) was lower (P < 0.01) in cattle fed MDGS when compared to the control diet. The inclusion of MDGS within the diet may affect energy partitioning between IMF and subcutaneous fat deposition. This data suggests that feeding MDGS at inclusion levels of 20 or 40% may result in greater subcutaneous fat deposition with minimal effects on marbling.

Table 1.

Item	0% MDGS	20% MDGS	40% MDGS	SEM	Probability
Number of pens	7	7	7	-	-
Carcass adjusted ADG, kg	1.33	1.46	1.37	0.05	0.22
DMI, kg/d	8.63	8.85	8.75	0.27	0.85
Carcass adjusted G:F	0.154^{a}	0.164^{b}	0.156^{ab}	0.003	0.08
Shrunk dressing %	61.61^{a}	62.63^{b}	61.83^{ab}	0.32	0.09
Calculated yield grade	2.6^{a}	2.9^{b}	2.9^{b}	0.08	0.06
SQF, cm	1.08	1.22	1.22	0.05	0.12
Marbling (400 = slight, 500 = small)	505.4	515.7	492.6	9.7	0.27
$IMF_{Ultrasound}$ (IMF/SQF)	11.69^{a}	9.97^{b}	9.76^{b}	0.40	0.01

^{ab}Means with unlike superscripts differ.

Key Words: beef, distillers grains, fat deposition

327 Dietary inclusion of CLA changes fatty acid profiles of pigs fed 30% DDGS during the growing-finishing phase. D. Pompeu*, R. B. Hinson, Z. P. Zhu, B. R. Wiegand, J. W. Rickard, and G. L. Allee, *University of Missouri*, *Columbia*.

The objective of this study was to evaluate dietary inclusion of DDGS at 30% and CLA at 0.6%. Forty barrows were assigned to a 2×2 factorial arrangement within a completely randomized design with a total of 10 replications. Pigs received ad libitum access to water and feed. Pigs were slaughtered at an average live weight of 129.88 ± 1.21 kg. Data was collected for growth performance, carcass and meat quality and fatty acid profile analysis. The inclusion of CLA in the diet did not significantly affect any of the parameters analyzed for carcass and meat quality. However, the inclusion of DDGS decreased the redness (P<0.05) of the longissimus muscle and increased the flexibility (P<0.05), both vertical and horizontal, of the belly. A significant interaction was observed for jowl and belly samples for total saturated fatty acids (SFA) and total polyunsaturated fatty acids (PUFA) (P<0.05). For both jowl and belly samples, the maximum amount of SFA (41.06 and 39.32%, respectively) were obtained by the DDGS only diet. The maximum amount of PUFA was obtained by the treatment DDGS + CLA for both jowl and belly samples (22.53 and 23.76%, respectively). The interaction of CLA and DDGS did not affect (P>0.13) the amount of monounsaturated fatty acids (MUFA) for both belly and jowl samples. However, the inclusion of CLA and also, the inclusion of DDGS in the diet, affected (P<0.05) the MUFA content in both jowl and belly samples. The maximum amount of MUFA (49.21% for the jowl samples and 50.50% for belly samples) was obtained by the samples of pigs fed the control diet, with no CLA and DDGS. The iodine value of the samples were affected (P<0.05) by the inclusion of CLA, DDGS and the interaction between them for both jowl and belly samples. The highest value was obtained from the samples of pigs fed DDGS with no CLA (71.18 and 72.19 for jowl and belly, respectively). Overall, this experiment indicates that DDGS and CLA and their interaction do not affect in a large proportion the carcass and meat quality when fed to finishing barrows. However, significant changes can be achieved in the fatty acid profile as measured in the belly and jowl.

Key Words: CLA, DDGS, iodine value

328 Effects of distillers grains on beef carcass quality and palatability. C. R. Calkins*, A. S. de Mello Jr., and L. S. Senaratne, *University of Nebraska*, *Lincoln*.

Distillers grains, mostly obtained from ethanol production, can be used in cattle diets. Results of 3 experiments show that feeding wet distillers

grains plus solubles (WDGS) does not negatively influence, and may benefit, marbling score. When cattle are fed WDGS, a higher amount of 18:2 fatty acid is observed at the duodenum, and higher amount of polyunsaturated fatty acids (PUFA) as well as 18:2 and Omega 6 are found in the infraspinatus (top blade), longissimus (ribeye), and psoas major (tenderloin) muscles. Those muscles have higher oxidation when displayed at simulated retail conditions for 7, 14 and 21 days ($P < 0.05$). A series of studies suggest that higher visual discoloration ($P < 0.05$) is observed on strip loin, tenderloin and top blade steaks from cattle fed WDGS. Top blade and tenderloin steaks from cattle fed 30% WDGS were significantly less red (lower a* values) after 3 d of retail display ($P < 0.04$). This effect is originated by higher PUFA and oxidation. Higher discoloration is observed when long aging periods are practiced before the meat goes to retail display. No significant effects on objective tenderness (WBSF - Warner-Bratzler shear force) and sensory attributes (except off-flavor notes) were observed. More livery off flavors have identified when meat from animals fed WDGS is subjected to retail display. In addition, the solubles in WDGS are high in minerals which may lead deviation in flavor. Vitamin E tends to mitigate negative effects caused by feeding WDGS. Therefore, it is clear that feeding WDGS does not compromise marbling or tenderness. Shelf life (color stability and oxidation) and off-flavor issues may be controlled by vitamin E.

Key Words: beef quality, distillers grains, palatability

329 Effects of various coproducts on beef consumer sensory and tenderness traits. G. P. Lardy* and R. J. Maddock, *North Dakota State University*, *Fargo*.

Food processing industries generate significant volumes of processing coproducts typically used in livestock diets. As industrial and bioenergy demands for corn continue to increase, increasing emphasis on coproduct use in beef cattle production will occur in an effort to reduce costs. Traditional research has investigated a variety of coproducts and the effects on ADG, DMI, G:F, and carcass data. However, increasing emphasis must be placed on the effects on consumer sensory traits and tenderness when these coproducts are used in beef cattle finishing diets. The effects of corn coproducts are covered in a companion abstract while this abstract focuses on other coproducts such as potato processing waste, wheat middlings, sugar beet processing byproducts, glycerol, and other vegetable wastes. Unfortunately, data regarding the effects of these byproducts on beef consumer sensory and tenderness traits is limited. Work in several laboratories has investigated the effects of feeding potato processing waste on consumer sensory traits and indicates few differences in palatability, including juiciness, tenderness, or flavor when potato waste is fed at levels which maintain acceptable feedlot performance. Little, if any, data has investigated the effects of wheat middlings, sugar beet processing byproducts, and other vegetable wastes on meat quality traits. In the future, additional research should investigate the effects of these and other coproducts on mechanical shear force, and sensory ratings of tenderness, juiciness, and flavor. Future work should focus on characterizing the composition of coproducts, especially as it relates to compounds or components which may have positive or negative influences on beef flavor, color, and palatability (e.g. fat and fat soluble compounds). In addition, steps should be taken to investigate any possible concerns related to chemical components which may result in off-flavors or reductions in shelf life of fresh meat and further processed meat products. The use of feedstuffs or feedstuff combinations which decrease consumer acceptance of beef should be limited, or not used in beef cattle finishing diets.

Key Words: beef, coproducts, sensory characteristics

330 By-product feeding effects on pork quality and carcass traits. J. D. Wood*, F. M. Whittington, and K. G. Hallett, *University of Bristol*, *Langford, Bristol, UK*.

Many components of pig diets are by-products of industrial processes whose main aim is the production of foods or other materials for human use. Protein meals derived from oil seeds from which most of the oil has been extracted are important examples eg soyabean meal and rapeseed/canola meal. Distillers dried grains and solubles (DDGS), a by-product of ethanol production from maize, is another protein source. Interest in these protein meals from a meat quality perspective centers around their effect on the oiliness and firmness of fat tissues. Soft or oily fat is more difficult to process into ham or bacon and causes fresh cuts to lose their rigidity and become 'floppy'. These effects are due to the residual oil present in the meal. This makes an important contribution to energy value but because the oil is high in polyunsaturated fatty acids (PUFA), it will be incorporated into fat tissue and soften it if excessive amounts are fed. By-products high in saturated fatty acids such as palm kernel meal produce firmer carcass fat. The major PUFA in protein meals including soyabean meal and DDGS is linoleic acid (18:2n-6) whose fat softening effect is explained by a very low melting point. A close association between the amount of 18:2n-6 in the diet, its concentration in carcass fat and the hardness/softness of backfat and pork cuts has been demonstrated in several studies. A summary of work at Bristol showed that unacceptably soft fat occurred at values above 15% of total fatty acids in backfat. This was achieved at a level of about 1.6% 18:2n-6 in the diet and this figure has been used as an upper limit for formulation of finishing diets in Britain. However, this figure is based on pigs having fat thickness values of 12-14mm. The 18:2n-6 concentration can be increased above 1.6% in fatter pigs without adverse effects on fat quality because higher fatness itself depresses the concentration of 18:2n-6 in total fatty acids.

Key Words: by-products, swine, fat quality

Nonruminant Nutrition: Amino Acids and Energy

331 Birth order, birth weigh, sow colostrum IgG, and pig IgG concentration and their effects on neonatal piglet survival. R. Cabrera*[1], X. Lin[1], K. Shim[1], T. Inskeep[1], J. Campbell[2], A. Moeser[1], and J. Odle[1], [1]*North Carolina State University*, *Raleigh*, [2]*American Protein Coporation*, *Ankeny, IA*.

Uptake of colostrum after birth is essential to stimulate intestinal growth and function, and provides systemic immunological protection via absorption of Immunoglobulin G (IgG). The birth order and weight of 745 piglets (from 75 litters) were recorded during a one-week period of farrowing. Only pigs weighing greater than 0.9 kg birth weight were chosen for the trial. Sow colostrum was collected during parturition, and piglets were bled between 48 and 72 hours post-birth. Pig serum IgG and colostral IgG concentrations were determined by radial immunodiffusion. The data were analyzed using the GLM and REG procedures of SAS. Sow colostral IgG concentration explained 6% and piglet birth order accounted for another 4% of the variation observed in pig