was lower (2.0 vs. 13.8 g/d) for LOWP than other diets, suggesting that cattle fed 0.12% P were deficient and excreting 85.3 % of the P fed.

Key Words: Excretion, Phosphorus, Cattle

474 Effects of dietary supplemental vitamin A concentration on growth, intake, and marbling in yearling feedlot steers. T. C. Bryant*[1,3], J. J. Wagner[2], T. E. Engle[3], K. L. Dorton[3], P. D. Burns[3], and M. L. Galyean[4], [1]*ContiBeef LLC, Boulder, CO,* [2]*Continental Beef Research, Lamar, CO,* [3]*Colorado State University, Fort Collins,* [4]*Texas Tech University, Lubbock.*

Recent research has shown a negative correlation between marbling and serum retinol concentration in Japanese Black cattle. Three hundred sixty single-source black, yearling steers (average initial BW = 316 ± 9.1 kg) fed a 91 % concentrate (steam-flaked corn base) diet were used to evaluate the effects of supplemental vitamin A concentration on performance, DMI, and carcass traits. Steers were blocked into eight weight replicates and assigned randomly to pens (n = 9/pen) and to diets containing 0, 1,103, 2,205 4,410, or 8,820 IU of supplemental vitamin A/kg DM. Daily DMI, ADG, and feed:gain ratio were determined for each 28-d period and for the overall 142-d trial. Final BW (586, 580, 590, 584, and 584 kg for 0, 1,103, 2,205 4,410, and 8,820 IU vitamin A/kg DM, respectively) did not differ (P > 0.10) among treatments. Feed efficiency, ADG, and daily DMI also did not differ (P > 0.10) among treatments within each 28-d period or for the overall trial. From d57 to harvest, average DMI (10.33, 10.28, 10.57, 9.75, and 10.22 kg/steer daily for 0, 1,103, 2,205, 4,410, and 8,820 IU vitamin A/kg DM, respectively) was lower (P < 0.02) for steers receiving 4,410 IU vitamin A/kg DM than for steers in other treatments, and DMI was greater (P = 0.06) for the 2,205 IU vitamin A/kg DM treatment than for the 8,810 IU/kg DM treatment. Marbling score, hot carcass weight, longissimus muscle area, and 12th rib fat thickness did not differ (P > 0.10) among treatments. Similarly, the number of carcasses grading ≥ Choice (62.6, 52.8, 64.0, 58.4, and 58.4 % for 0, 1,103, 2,205, 4,410, and 8,820 IU vitamin A/kg DM, respectively), Select, or ≤ Standard did not differ (P > 0.10) among treatments. Results of this trial suggest that vitamin A supplementation up to twice the NRC-suggested concentration has little effect on performance or marbling in typical yearling feedlot steers.

Key Words: Cattle, Marbling, Vitamin A

475 Effects of feeding a polyclonal antibody preparation against *Streptococcus bovis* or *Fusobacterium necrophorum* on performance and carcass characteristics of feedlot steers. C. R. Dahlen[2], N. DiLorenzo*[1], A. DiCostanzo[1], G. C. Lamb[2], and L. J. Smith[1], [1]*Department of Animal Science, University of Minnesota, St. Paul,* [2]*North West Research and Outreach Center, Crookston, MN,* [3]*North Central Research and Outreach Center, Grand Rapids, MN.*

Steer calves (n = 226; 272 kg), stratified by weight and housed in 16 pens, were used to evaluate effects of feeding a polyclonal antibody preparation (Ab; sprayed onto a soyhull pellet) against *Streptococcus bovis* (AbSb) or *Fusobacterium necrophorum* (AbFn) on performance and carcass characteristics for 153 d. Pens were randomly assigned to one of four dietary treatments resulting from a 2 X 2 factorial arrangement that included AbSb or AbFn. Diets (1.39 Mcal NEg/kg DM, 12.5% CP, 0.7% Ca, and 0.35% P) were formulated with high-moisture corn and dry ground corn (50:50 mix, DM basis), corn silage, and supplement. Interaction terms for final and carcass-adjusted final weight, gain and carcass-adjusted gain were significant (P < 0.05). Steers receiving AbSb or AbFn had heavier (P < 0.05) final BW resulting from faster (P < 0.05) daily gains. Adjusted-final weights of steers fed AbSb were heavier (P < 0.05) than those fed both or no Ab. Only AbSb was effective (P = 0.08) at enhancing carcass-adjusted daily gain. Interestingly, steers receiving both Ab gained similarly (P > 0.05) as steers fed no Ab. Interaction terms were significant (P < 0.05) for feed efficiency (analyzed as gain-to-feed), and tended (P < 0.08) to be significant for carcass-adjusted feed efficiency. Steers receiving AbSb were more efficient (P < 0.06) than those receiving both or no Ab. Steers receiving AbSb were more efficient (carcass-adjusted; P < 0.09) than those receiving both or no Ab. Steers supplemented with AbSb had heavier carcasses (P < 0.05), which accounted for greater (P < 0.05) subcutaneous fat, and greater (P < 0.05) yield grades than those of steers fed both or no Ab. These results demonstrate that feeding a polyclonal antibody preparation against Streptococcus bovis or Fusobacterium necrophorum influences performance and carcass characteristics of feedlot cattle fed high-grain diets.

Key Words: *Streptococcus bovis*, *Fusobacterium necrophorum*, Steers

Ruminant Nutrition: Dairy - Lactation, Health & Gut Physiology

476 Effect of dietary cation-anion difference and crude protein on milk yield and blood metabolites of lactating dairy cows. C. D. Wildman*, J. W. West, and J. K. Bernard, *The University of Georgia, Tifton.*

Eight ruminally cannulated lactating Holstein cows averaging 47 ± 10 DIM were used in a 12 wk replicated 4 x 4 Latin Square trial to determine the relationship between dietary cation-anion difference (DCAD) and dietary crude protein (CP) concentration. The study was conducted from March 28 through June 19. Treatments were arranged as a 2 x 2 factorial to provide 15 or 17% CP and DCAD of 25 or 50 meq/100 g DM (Na+K-Cl). As DCAD increased from 25 to 50, increases ($P < 0.01$) in DMI (17.8 to 19.1 kg/d), yield of 3.5% fat-corrected milk (20.2 to 23.7 kg/d), energy-corrected milk (20.5 to 23.8 kg/d), fat (0.6 to 0.8 kg/d) and protein (0.7 to 0.8 kg/d) were observed. Blood Na and bicarbonate ($P < 0.05$, $P < 0.01$) were greater for DCAD 50 (144 and 24.5 mmol/L) compared with 25 (143 and 22.3 mmol/L). Blood Mg decreased ($P < 0.01$) as DCAD increased from 25 to 50 (2.5 to 2.2 mg/dl). An increase ($P < 0.01$) in blood pH (7.46 to 7.50) was also noted with increasing DCAD . Urinary bicarbonate:creatinine ratio was higher ($P < 0.01$) for DCAD 50 (2.6) versus 25 (0.6). Greater microbial crude protein production, indicated by uric acid:creatinine ratio, was noted with increasing DCAD at low CP compared to that observed with high CP, resulting in an interaction ($P < 0.05$). Fractional excretion of K was greater ($P < 0.01$) for DCAD 50 (78.8) compared to DCAD 25 (38.3) whereas fractional excretion of Mg ($P < 0.05$) was reduced for high DCAD (9.6) relative to low DCAD (13.0). A DCAD x CP interaction ($P < 0.05$) was observed for fractional excretion of Na with an increase in DCAD resulting in increased excretion of Na at both high and low CP. The magnitude of the increase was greater at low CP compared to that observed at high CP. Results indicate that increasing DCAD improves intake and performance, which suggests improved N utilization on lower CP diets.

Key Words: Dietary Cation-Anion Difference, Dietary Crude Protein

477 Effect of dietary cation-anion difference and dietary crude protein degradability on milk yield and blood metabolites of lactating dairy cows. C. D. Wildman*, J. W. West, and J. K. Bernard, *The University of Georgia, Tifton.*

Eight ruminally cannulated lactating Holstein cows averaging 180 ± 10 DIM were used in a 12 wk replicated 4 x 4 Latin Square trial to determine the relationship between dietary cation-anion difference (DCAD) and protein degradability (UIP). The study was conducted from August 8 through November 6. Diets were formulated to provide 15% dietary crude protein (CP) across all treatments. Treatments were arranged as a 2 x 2 factorial to provide DCAD of 25 or 50 meq/100 g DM (Na+K-Cl) and 33 or 42% of CP as UIP. Increasing DCAD from 25 to 50 increased ($P < 0.01$) DMI (17.0 to 18.0 kg/d), 3.5% fat-corrected milk (19.1 to 20.0 kg/d), fat (0.6 to 0.7 kg/d), and energy-corrected milk (19.5 to 20.4 kg/d) yield. A significant DCAD x degradability interaction ($P < 0.01$) was observed for each of these parameters with the magnitude of the DCAD effect much greater at 42% UIP compared with 33% UIP, where no difference was observed. Blood bicarbonate (22.5 to 24.4 mmol/L) and pH (7.41 to 7.43) increased ($P < 0.01$) as DCAD increased from 25 to 50, respectively. Urinary bicarbonate increased ($P < 0.01$) at DCAD 50 (69.1 mmol/L) over that observed at DCAD 25 (20.3 mmol/L). A DCAD x UIP interaction ($P < 0.05$) was observed for uric acid:creatinine ratio, an indicator of microbial crude protein production, because a decrease was observed with DCAD 50 versus 25 at 33%UIP (0.5 to 0.4) but no differences were observed between DCAD for 42%

UIP. Fractional excretion of Na (0.3 to 0.9), K (35.8 to 61.6), Cl (0.26 to 0.76), and bicarbonate (1.07 to 5.65) increased while Mg (11.54 to 7.36) and Ca (1.4 to 0.3) decreased ($P < 0.01$) as DCAD increased from 25 to 50, respectively. No interactions were noted for fractional excretion of minerals or blood parameters. Results of this trial indicate that increasing DCAD in diets with high concentrations of UIP can improve intake and performance of lactating dairy cows by improving dietary protein utilization.

Key Words: Dietary Cation-Anion Difference, Protein Degradability

478 Maternal undernutrition from early- to mid-gestation versus throughout gestation: Effects on visceral organs of ewes and their fetuses. B. W. Hess*[1], K. A. Vonnahme[2], E. J. Scholljegerdes[1], S. L. Lake[1], J. D. C. Molle[1], V. Nayigihugu[1], R. L. Atkinson[1], P. A. Ludden[1], L. R. Miller[1], and S. P. Ford[1], [1]*Department of Animal Sciences, University of Wyoming, Laramie,* [2]*Department of Animal and Range Sciences, North Dakota State University, Fargo.*

Twenty-one multiparous ewes were used to determine the influence of maternal nutrient restriction on visceral tissues of the ewe and fetus. Control (CON) ewes (n = 4 singles; n = 4 twins) were fed pelleted beet pulp fortified with vitamins and minerals to meet requirements. From d 28 to 78 of gestation, the remaining ewes were fed 50% of CON. Beginning on d 78 of gestation, nine undernourished ewes were fed CON (UC, n = 4 singles; n = 5 twins) whereas four undernourished ewes continued to be fed 50% of CON until d 135 of gestation (UU, n = 2 singles; n = 2 twins). Rations were adjusted weekly for BW changes throughout the experiment. All ewes were slaughtered on d 135 of gestation, and ewe visceral tissues and fetal digestive tracts were measured. Eviscerated BW (EBW; $P = 0.02$) and weights of the lungs ($P = 0.03$) and heart ($P = 0.07$) were reduced in UU ewes. Total digestive tract weights were less ($P = 0.06$) for UU ewes because of reduced (P #8804 0.10) weights of the stomach, small intestine, and colon. However, the pancreas, liver, and heart of UU ewes were greater (P #8804 0.11; % of EBW) than CON or UC ewes. The weights of fetal digestive tracts were less ($P = 0.09$) for UU fetuses due to reduced ($P = 0.04$) stomach weights. Because of reduced ($P = 0.03$) EBW for UU fetuses, fetal digestive tract components (% of EBW) were not affected ($P = 0.18$ to 0.95) by dietary treatment. Twin fetuses had lighter ($P = 0.11$) EBW, but heavier ($P = 0.01$) stomach weights (% of EBW) than single fetuses. Undernourishment during gestation will decrease maternal and fetal digestive tract weights in a manner proportional to decreased BW. The ability of ewes and their fetuses to maintain equal or greater relative weights of visceral organs (% of EBW) despite being undernourished may be necessary to ensure proper physiological function.

Key Words: Ewes, Fetus, Visceral Organs

479 Energy requirement of close-up dairy cows grazing pasture. J. R. Roche*[1], E. S. Kolver[1], and J. K. Kay[1,2], [1]*Dexcel, Hamilton, New Zealand,* [2]*University of Arizona, Tucson.*

Fifty-two multiparous grazing dairy cows (BW:442±65.2kg) were randomly allocated to four levels of pasture DMI for 27±9.6 days precalving. Cow DMI was 1.3, 2.0, 2.3 and 2.6% of BW of fresh pasture. Following calving, all cows were grazed together and offered pasture to appetite. Daily milk yields were recorded postcalving and fat, protein and lactose concentrations determined on 2 days each wk for 5 wk. Blood was sampled 17 d precalving, on the day of calving and on d 1, 2, 3, 4, 7, 14, 28 and 35 postcalving. Loss of BW precalving was linearly ($P<0.001$) related to precalving feeding level and only cows consuming 2.6% BW gained BW at a rate that suggested a positive energy balance. This was supported by a quadratic decrease ($P<0.001$) in plasma NEFA and BHBA, a linear decrease ($P<0.05$) in growth hormone (GH), and a corresponding quadratic increase in IGF-1 ($P<0.001$), leptin ($P<0.1$) and glucose ($P<0.05$), as precalving DMI increased. Apart from GH and IGF-1, where differences in plasma concentrations remained during the colostrum period, precalving DMI did not change postcalving plasma concentrations of these metabolites. Similarly, precalving DMI did not affect milk yield or the yield of fat, protein or lactose in milk, although BW loss increased ($P<0.001$) postcalving with increasing precalving level of feeding. Based on changes in BW, these results indicate that 6.0 Mcal ME/100kg BW was required precalving to maintain cow energy balance, considerably more than is currently recommended. However, precalving DMI did not affect milk production. Further research is required to determine if an interaction exists between pre- and postcalving level of feeding.

	Pre-	calving	DMI	(% BW)		*P*-	value
Variable	1.3	2.0	2.3	2.6	SED	DMI	L
ME Intake (Mcal/100 kg BW)	3.3	5.1	5.8	6.4	0.51	<0.001	<0.001
Milk yield, kg/d	19.7	21.1	19.3	20.6	1.48	0.85	0.45
Fat, %	4.79	4.81	5.10	5.05	0.238	0.75	0.48
Protein, %	3.72	3.79	3.77	3.77	0.078	0.55	0.30
Postcalving DMI, %BW	3.0	3.0	2.8	2.6	0.227	0.26	0.06
BW at calving, kg	424	441	458	468	8.1	<0.001	<0.001
BW change precalving, kg/d	-1.2	-0.1	0.5	0.9	0.41	<0.001	<0.001
BW change postcalving, kg/d	-1.0	-1.3	-1.6	-2.0	0.27	<0.001	<0.001

Key Words: Transition Cow, Pasture, Energy Balance

480 Potential for dairy feeds to harbor an invasive mold (*Aspergillus fumigatus*): Implications to herd health. S. B. Puntenney*, Y. Wang, and N. E. Forsberg, *Oregon State University, Corvallis.*

Ruminant animals are susceptible to mycotic infections. The most-frequently encountered mycotic infections include *A. fumigatus* and *Candida albicans*. The most common sites for infection are the GI tract (omasum, abomasum and Peyer's Patches) and the lung. Symptoms of mycoses include coagulopathies and death. Factors which increase susceptibility to mycoses include immunosuppression, acidosis, anti-microbials, BVD and stress. At present, the significance of mycotic infections to dairy production is not certain. Dairy feeds, especially silages and commodities which are poorly managed, have potential to support growth of pathogenic molds. *A. fumigatus* is a thermotolerant, ubiquitous mold which prefers an acidic environment. It requires oxygen, a food source and moisture for growth. Poor handling of commodities and silages increases the possibility of mold growth. In this study we surveyed the prevalence of *A. fumigatus* in common dairy feeds. A quantitative Sybr-Green real-time PCR assay was developed to assess concentrations of *A. fumigatus* DNA. Seventy-three samples were obtained from dairies in Oregon. Feed samples were dried and ground and then DNA was extracted for Sybr-Green PCR analysis. Mean concentrations of *A. fumigatus* (spores/g) were: corn (11,286), corn/barley mix (33,156), SBM (158), beet pulp (26,966), whole cottonseed (15,363), distillers dried grains (11,516), wheat mill run (6,480), grass silage (9,304), corn silage (14,785) and spoiled silage (1,300,000). We conclude that dairy cows will be continually exposed to *A. fumigatus* and that spoiled silages harbor the highest concentrations of this invasive mold. Additional factors (e.g., stress or acidosis) are likely required to permit mycoses to develop in an individual animal. Healthy humans are resistant to *A. fumigatus* infection. Immunosuppression increases susceptibility of an individual to infection. It is possible that stress and immunosuppression in ruminants similarly predispose to mycotic infection.

Key Words: *A. Fumigatus*, Dairy Feeds, Immunosuppression

481 Is ruminal acidosis related to high diet fermentability or low buffer recycling? D. Sauvant*[1] and D. Mertens[2], [1]*Département Des Sciences Animales, Institut National Agronomique Paris Grignon, Paris, France,* [2]*US Dairy Forage Research Center, West Madison, WI.*

Rumen pH is the outcome of the balance between organic acids produced by diet fermentation and buffer recycling through salivation and chewing. The aim was to elucidate if one of these factors is more important that the other in ruminal acidosis. A database was compiled from 102 published experiments (nexp) containing 264 treatments. To be included in the database, an experiment must have variation in dietary

proportion of concentrate or NDF (NDF = 39.5 ±13.7 % DM) and provide data on ruminal pH (pH = 6.21 ± 0.34), liquid outflow rate (LOR = 12.1 ± 4.0 L/kg DM), and ruminally digested OM (rdOM = 39.5 ± 10.3 % DM). The LOR is an index of buffer recycling/kg DMI and rdOM is an index of VFA production/kg DMI. The compliled data also included dry matter intake (DMI = 2.81 ± .87 % LW) and Acetate/Propionate ratio (A/P = 3.18 ± 0.89). Data were analyzed using GLM procedure to separate variances among and within experiment. On 52 experiments and 132 treatments when ruminal pH was compared to rdOM, there was no significant relationship among or within the diets. In contrast, the small regression standard deviation (rsd) indicated that ruminal pH was fairly accurately explained within diets by LOR: pH = 4.90 + 0.15(LOR) - 0.003(LOR2); n = 86, nexp = 35, rsd = 0.09. With the A/P ratio, another index of ruminal perturbation, there was a curvilinear relationship with rdOM: A/P = -0.59 + 0.50(rdDOM) - 0.011(rdOM2); n = 79, nexp = 32, rsd = 0.46. However, the corresponding relationship was more accurate with LOR: A/P = - 0.57 + 0.52(LOR) - 0.014(LOR2); (n = 75, nexp = 30, rsd = 0.30). In conclusion, this summary of published research indicates that perturbations in ruminal pH and A/P are related more to LOR, which is linked to diet fibrosity indexes and chewing activity, than to differences in dietary variation linked to rdOM.

Key Words: Acidosis, Ruminal Digestibility, Ruminal pH Turnover

482 Design of a bovine metabolism gene array. B. E. Etchebarne*, W. Nobis, M. S. Allen, and M. J. VandeHaar, *Michigan State University, East Lansing*.

First generation microarrays employing extensive cDNA libraries have allowed high numbers of both known and unidentified genes to be surveyed. Many of these arrays have only one spot per gene, leaving no margin for measurement error and giving no information on variance of replication. The Human Genome Project has provided extensively annotated databases, such as Locuslink, the Kyoto Encyclopedia of Genes and Genomes (KEGG), The Institute for Genomics Research (TIGR), and BioCarta. These publicly available resources, paired with recent price reductions in oligonucleotide synthesis, allow researchers to feasibly design and produce microarrays with gene sets tailored to specific research areas. Using these databases, we identified approximately 2000 bovine genes representing enzymes of metabolic pathways, metabolic regulators and receptors, transport and binding proteins, intracellular signaling cascades, and cell cycle and apoptotic pathways. Three individual 70mer oligonucleotide probes per gene were designed for triplicate spotting onto glass slides, giving nine spots per gene. Each oligonucleotide was designed within specific parameters to standardize hybridization behavior. Use of multiple oligonucleotides per gene improves representation of the expressed fraction of each gene, including splice variants. High spot replication improves within-array quality control and increases the statistical power of detecting small changes in expression at a lower cost than slide replication. Statistical power is especially important for metabolic research, in which changes in gene expression are often subtle. In addition, our focus on only those genes that are relevant to metabolism improves downstream bioinformatics and data analysis for integration of metabolic gene networks. Because all genes included in this design are annotated with corresponding human homologs, the design can be applied to other species to promote our understanding of comparative metabolism. In conclusion, our design of a focused oligonucleotide microarray with multiple spots per gene will facilitate research in the metabolic genomics of cattle and can be easily applied to other species and disciplines.

Key Words: Microarray, Metabolism, Statistical Power

483 Effect of increasing ruminal valerate, caproate, and heptanoate on splanchnic metabolism of VFA absorbed from the washed reticulorumen of steers. N. B. Kristensen*[1] and D. L. Harmon[2], [1] *Danish Institute of Agricultural Sciences, Tjele, Denmark,* [2] *University of Kentucky, Lexington*.

Four steers fitted with a ruminal cannula and chronic indwelling catheters in the mesenteric artery, mesenteric vein, hepatic portal vein, hepatic vein, as well as in the right ruminal vein were used to study the absorption and metabolism of VFA from bicarbonate buffers incubated in the temporarily emptied and washed reticulorumen. Each treatment was incubation of a bicarbonate buffer in the rumen for 90 min and continuous infusion of ruminal infusate to maintain a constant rate of VFA disappearance. Treatments were control (VFA mixture) or added valerate (VAL), caproate (CAP) or heptanoate (HEP). With the control the ruminal disappearance rates were 585 ± 24, 257 ± 10, 12 ± 0.4, 118 ± 3, and 17 ± 1 mmol/h of acetate, propionate, isobutyrate, butyrate, and valerate, respectively. With VAL, the valerate disappearance increased to 99 ± 1 mmol/h. Ruminal disappearance of caproate and heptanoate were 57 ± 1 and 60 ± 0.4 mmol/h with CAP and HEP, respectively. Net portal flux (68 vs. 39 ± 2 mmol/h) and splanchnic flux (22 vs. 10 ± 1 mmol/h) of butyrate increased (P = 0.01) with VAL compared with control. The concentration difference of butyrate between artery and ruminal vein increased (P = 0.01; 0.242 vs. 0.120 ± 0.007 mmol/kg blood) with VAL compared with control indicating that butyrate metabolism by the ruminal epithelium was inhibited by the increased valerate. Net portal flux of caproate and heptanoate accounted for 54 and 43% of the ruminal disappearance, respectively. The splanchnic flux of caproate and heptanoate accounted for less than 2% of the ruminal disappearance rate indicating complete metabolism by the splanchnic-drained viscera. Caproate and heptanoate affected rumen epithelial butyrate metabolism less than the increased valerate.

Key Words: Cattle, Energy Metabolism, Volatile Fatty Acids

ALPHARMA Beef Cattle Symposium: Factors Affecting Feedlot Profitability

484 Assessing the cost of beef quality. J. D. Lawrence*, C. Forristall, and G. May, *Iowa State University, Ames*.

The number of U.S. fed cattle marketed through a value-based or grid marketing system is increasing dramatically. Most grids reward Choice or better quality grades and some pay premiums for yield grades. The Choice-Select (C-S) price spread increased 55 percent, over $3/cwt during the 1990s. However, there is a cost associated with pursuing these carcass premiums both in the feedlot and the cowherd. Correlations between carcass and performance traits resulted in economic tradeoffs that change across input costs and quality grade premiums and discounts. Feedlot profitability was largely determined by marbling, carcass weight, and feed efficiency. Carcass weight was most important at a low C-S spread but give way to marbling at average and higher quality premiums. Data suggests that cow size and marling score are negatively correlated. The current trend toward wider C-S spreads places greater emphasis on marbling ability of calves. These correlations and results suggest that higher marbling is associated with lower cost cows to maintain.

Key Words: Beef, Feedlot Profits, Grid Marketing

485 The effect of cattle health on performance, production costs, and carcass value. R. L. Larson*, *College of Veterinary Medicine, Commecial Agriculture Program, University of Missouri, Columbia*.

Bovine respiratory disease (BRD) and possibly other diseases may detrimentally affect weight gain, carcass weight, rib eye area, marbling, and meat tenderness of feedlot cattle. Gardner et al. (1999) found steers with lung lesions had lighter hot carcass weights, lower dressing percentage, less internal fat, and lower marbling scores than steers without lesions. Steers with lung lesions also tended to have less external fat and smaller longissimus muscle area than healthy counterparts.

A clear mechanistic pathway linking disease to changes in growth and carcass traits has not been described. In their review of feedlot cattle growth, Owens et al. (1995) summarized that rate and composition of tissue accretion may be controlled by chronological age, physiological age, energy intake, hormonal status, relative turnover of tissues, cell number, and cell activity. Disease could conceivably impact all of these control processes except chronological age. There are three possible mechanisms by which disease may impact growth and carcass traits. First, metabolic signals such as cytokines and cortisol could have an effect on carcass composition through modification of hypothalamic secretions of thyrotropin-releasing hormone, by inhibition of IGF-I and insulin actions on muscle and fat tissues, and by direct protein catabolism