T174 Effect of diet on biotin balance in sheep. T. E. Peterson*[1], L. R. McDowell[1], R. J. McMahon[1], W. M. Seymour[2], N. S. Wilkinson[1], F. G. Martin[1], and P. R. Henry[1], [1]*University of Florida, Gainesville, FL,* [2]*Roche Vitamins Inc., Parsippany, NJ.*

Eight wether sheep were utilized in an experiment to determine the effect of diet forage: concentrate ratio on biotin balance. The pelleted diet included alfalfa, corn, soybean meal and corn oil. The four diets were formulated in percentages to contain forage:concentrate ratios as follows: A, 95:5; B, 50:50; C, 30:70; D, 10:90. Sheep were placed in metabolic crates and fed their respective diet for a period of ten days. The experiment was constructed as a 4x4 Latin Square in which the four groups of two sheep were fed a different diet (A-D) in each of the respective treatments. For each diet change there was a 20 d period; 10 days of adaptation with the 50:50 forage to concentrate diet followed by 10 days of the designated treatment diet. Feedings were conducted twice daily; 8:00am and 4:00pm. Total collection of feces and urine for determination of biotin balance was done twice daily on days 8, 9, and 10 of each period. Analyzed biotin for the four diets was 0.176, 0.157, 0.122 and 0.096 μg/g, respectively. Biotin balance was negatively higher (P<0.05) for the forage:concentrate ratio of 30:70 compared to the highest forage or concentrate diets due to the high (P<0.05) fecal biotin concentrations.

Table 1. Biotin (μg) balance data (3d)[1].

	Diet A	Diet B	Diet C	Diet D
Feed	595±29^a	552±5^a	385±17^b	259±25^c
Feces	2588±201^b	3464±498^{ab}	4763±978^a	2588±211^b
Urine	402±76	279±58	371±40	378±76
Balance	-2395±229^b	-3191±524^{ab}	-4748±961^a	-2707±221^b

[1]Means ± S.E. ^{abc}Means with different superscripts, within a row, differ (P<0.05).

Key Words: Biotin, Sheep, Balance

T175 Effect of VFA on [^{15}N]ammonia utilization for amino acid and urea synthesis by ruminal epithelial and duodenal mucosal cells isolated from growing sheep. M. Oba*[1], R. L. Baldwin, IV[2], S. L. Owens[1], and B. J. Bequette[1], [1]*Department of Animal and Avian Sciences, University of Maryland, College Park, MD,* [2]*Bovine Functional Genomics Laboratory, ANRI, USDA-ARS, Beltsville, MD.*

The objective was to determine effects of VFA on the extent of assimilation of ammonia N into amino acids and urea by isolated ruminal epithelial (REC) and duodenal mucosal cells (DMC) in short-term incubations. Cells were isolated from growing Polypay ram lambs (n=4) fed a mixed forage-concentrate diet, and incubated for 90 min in media containing [^{15}N]ammonia and glucose plus either acetate or propionate (5 mM each). Production of Ala, Asp, Glu, Arg + citrulline, and urea, and ^{15}N enrichment were determined by gas chromatography-mass spectrometry. Data are presented as a production rate per 10^6 cells during 90 min incubations. In both cell types, the total release of Ala, Asp, Glu, Arg + citrulline, and urea was not affected by VFA treatment. However, for REC, assimilation of ammonia N into Glu (0.51 vs. 0.40 nmol; $P < 0.05$) was greater, and that into Asp (0.19 vs. 0.15 nmol; $P = 0.07$) and Ala (0.64 vs. 0.40 nmol; $P = 0.10$) tended to be greater for acetate compared to propionate treatment. However, ammonia N was not incorporated into Arg + citrulline and urea by REC. For DMC, assimilation of ammonia N into Ala, Asp, and Glu was also greater for acetate (1.57, 0.69, and 2.07 nmol, respectively) compared to propionate treatment (0.86, 0.46, and 1.37 nmol, respectively; all $P < 0.05$). Utilization of ammonia N for Arg + citrulline synthesis tended to be greater for acetate compared to propionate treatment (0.75 vs. 0.49; $P = 0.08$), but ammonia N was not incorporated into urea. In summary, ruminant gut tissues are capable of assimilating ammonia N into amino acids, and VFA type affects the extent of ammonia N utilization for amino acid synthesis.

Key Words: Ruminal epithelial cells, Duodenal mucosal cells, Ammonia utilization

Production, Management, and the Environment

T176 Use of electronic rumen boluses for identification of sheep in the U.S. G. Caja*[1], D. L. Thomas[2], M. Rovai[1], Y. M. Berger[2], and T. A. Taylor[2], [1]*Universitat Autonoma de Barcelona, Bellaterra, Spain,* [2]*University of Wisconsin-Madison.*

A total of 791 sheep in two research flocks at the University of Wisconsin-Madison were used to study the effectiveness of three types of electronic rumen boluses for individual animal identification. One flock consisted of dairy sheep and the other of meat and wool sheep. All sheep carried at least one ear tag with a unique number for identification. The three types of electronic rumen boluses consisted of ISO radio frequency transponders of different technology encased in capsules of different size and construction: B1 (full duplex; 20×74 mm, 70 g, white plastic cover), B2 (half duplex; 21×68 mm, 79 g, white ceramic cover), and B3 (half duplex; 12×42 mm, 16 g, brown ceramic cover). Boluses were given orally to all sheep (rams, adult ewes, ewe lambs) on a farm on the same day by both trained and untrained operators using appropriate balling guns. Bolus readability was checked immediately before and after administration to ensure that only functional boluses were administered and present in each sheep. Boluses in all sheep were read 1 d following administration, approximately one wk later, and at approximately 1 mo intervals thereafter through d 102 using handheld transceivers. Animals ranged in weight from 25 to 145 kg in body weight at the time of bolus administration, and there were no injuries or deaths from bolus administration. Application time averaged 71.4 s and was affected by operator ($P < 0.05$). Application time was greater ($P < 0.05$) for rams than for adult ewes or ewe lambs. Approximately 102 d after administration, bolus readability varied by sheep group (rams, 88.0%; ewes, 92.0%; ewe lambs, 86.9%; $P < 0.05$) and bolus type (B1, 63.2%; B2, 99.5%; and B3, 98.7%; $P < 0.001$). The B1 bolus was insufficiently readable for ICAR requirements of 98% readability, but the B2 and B3 boluses were very effective in electronic identification of sheep.

Key Words: Sheep, Electronic identification, Rumen bolus

T177 Effects of bolus features on retention performance in the electronic identification of cattle. J. J. Ghirardi, G. Caja*, D. Garin, and M. Hernandez-Jover, *Universitat Autónoma de Barcelona, Spain.*

A total of 782 crossbreed calves were used to evaluate the retention rate of 12 prototypes of electronic identification boluses during fattening. Male and female calves were fed with concentrate (1.89 Mcal EN_f; and, 15.0% CP, as feed) and straw ad libitum and slaughtered at approximately 480 and 380 kg BW, respectively, before one year of age. In order to determine the anatomical limit for a bolus passing through the gastrointestinal tract, the size of the reticulo-omasal orifice was measured at slaughter in a total of 70 males and 42 females. Bolus prototypes consisted of two series of ceramic capsules of different features containing a glass encapsulated half duplex transponder (31.8×3.8 mm). Series #1 (n=544) consisted of six types of boluses with the same external dimensions (68×21 mm) but different specific gravity (2.39, 2.9, 2.79, 2.95, 3.12 and 3.36); and series #2 (n=238) consisted of different commercial prototypes varying in external dimensions and specific gravity (39×15, 3.08; 51×15, 3.00; 64×16, 3.63; 68×17, 3.60; 62×19, 3.60; and, 66×20, 3.11). Total weights ranged from 20 to 75 g. Boluses were applied to milk fed calves (2 to 5 wk of age) restrained in a head-locker using a balling gun. Three calves in series #1 (0.6%) could not be applied at the first attempt due to difficulties in swallowing and were applied one wk later. Bolus retention was checked at mo 1, 5 and 7, and at slaughter by using a handheld transceiver with a stick antenna. Retention rate until slaughter varied quadratically ($R^2 = 0.96$) with a plateau according to bolus weight for the two series: #1 (89.5 to 100%) and #2 (76.2 to 100%). Four boluses were retrieved from the abomasum. Minimum weight and specific gravity to reach the 98% retention rate established by ICAR were estimated to be 65 g and up to 3.00 for cattle. Diameter of reticulo-omasal orifice differed between males (32.5 ± 1.4 mm) and females (29.9 ± 1.3 mm) and were greater than diameters of retained boluses. As a conclusion, bolus features need to be optimized in order to achieve their maximum retention rate in cattle.

Key Words: Transponder, Electronic identification, Traceability

T178 Effect of different alum applications on the environment of dairy calf hutches. J. C. Lin*[1], B. R. Moss[1], K. A. Cummins[1], P. J. Tyler[1], W. H. McElhenney[1], and C. W. Wood[2], [1]*Animal Science Department,* [2]*Agronomy and Soils Department, Auburn University, AL.*

The effect of aluminum sulfate (alum) on calf hutch environment was evaluated. Twenty eight hutches (Calf-Tel®; Hampel Corp) were bedded with 22.7 kg of wood shavings that had been mixed with 0, 2.85, 5.70, or 8.55 l of liquid aluminum sulfate (48.5% solution; 1.33 kg solution per l = 0.65 kg alum per l) that provided 0, 1.85, 3.70, or 5.55 kg dry alum. Calves were weighed at birth, assigned to alternating treatments and maintained in the hutches with no additional bedding provided during the study. Ammonia emissions were measured within hutches when calves were 4 and 8 weeks of age at 1400 h when ambient temperatures averaged 23°C. Bedding samples were taken at biweekly intervals from age 2 to 8 weeks and analyzed for coliform counts. At the same time, fly population on calves and within hutches was determined. Respiratory and scour scores were determined weekly and 8 week body weights determined. Ammonia emissions were significantly affected by week ($P<0.002$) and alum treatment ($P<0.05$). Rates of ammonia emission (mg per m^2 per min) were 0.35, 0.16, 0.23 and 0.11 for 0, 1.85, 3.70 and 5.55 kg alum per hutch treatment, respectively, at 4 weeks and 1.97, 0.91, 0.47 and 0.13 at 8 weeks. There was no treatment by week interaction (>0.1). Fly population and coliform counts (g^{-1}) increased ($P<0.01$) with time in hutches, but no differences ($P>0.1$) existed due to treatment. There was a trend ($P<0.1$) for fewer flies on calves housed in hutches treated with alum. Incidences of respiratory problems and scours were essentially nil regardless of the treatment nor was there any evidence of skin abrasions. Eight-week body weights did not differ (>0.76).

Key Words: Ammonia emissions, Aluminum sulfate, Calf hutches

T179 Growth performance and health of dairy calves bedded with different types of materials. R. Panivivat*[1], J. A. Pennington[2], E. B. Kegley[1], D. W. Kellogg[1], and S. L. Krumpelman[1], [1]*University of Arkansas, Fayetteville,* [2]*University of Arkansas Cooperative Extension Service, Little Rock.*

Granite fines (GF), sand (S), rice hulls (RH), long wheat straw (ST) and wood shavings (WS) used as bedding for 60 heifer calves were compared at Ark-Tenn Dairy Research and Development Facility, a commercial 1100-cow dairy in central Arkansas. Growth, health, stress indices, behavior, physical characteristics and bacterial counts of bedding from d 1 to 42 were evaluated from August to October 2002. There were differences ($P < 0.05$) due to bedding type in dry matter intake (DMI) during wk 2. Calves housed on RH had the greatest and those housed on WS had the lowest DMI. Calf average daily gain and DMI for the entire 42 d did not differ ($P > 0.05$) due to bedding type. Using a subjective cleanliness score (1= clean to 4 = dirty), calves housed on GF were the dirtiest in appearance. There was a bedding material by week interaction ($P < 0.01$) for the number of antibiotic treatments given for scour control. During wk 2 calves housed on GF and S were treated more often for scours. During wk 1 and 2, calves housed on ST received the fewest antibiotic treatments. Serum cortisol, alpha-1 acid glycoprotein, and immunoglobulin G concentrations, and neutrophil:lymphocyte ratio were not affected ($P > 0.05$) by bedding type. On d 0, GF were harder than sand ($P < 0.05$), and all materials were harder than straw ($P < 0.05$). In addition, there were bedding material by week interactions ($P < 0.05$) for coliform counts ($P < 0.05$). On d 0, coliform counts were lowest in GF and greatest in RH. However, on d 14, 28 and 42, coliform counts were greatest in ST. On d 42 the concentration of ammonia, 10 cm above the bedding was lowest ($P < 0.05$) for ST. Growth performance of calves bedded for 42 d with five bedding materials did not differ. However, the number of antibiotic treatments given for scours and bacterial counts in the bedding did vary due to bedding type.

Key Words: Dairy calves, Bedding material, Bacterial Counts

T180 Effect of free-stall design on cow behavior and performance. R. J. Norell[1], S. Mosley[2], A. Ahmadzadeh[2], and P. Deaton[1], [1]*University of Idaho, Idaho Falls,* [2]*University of Idaho, Moscow.*

The objective of this study was to assess the effects of free-stall design on cow behavior and performance. Two groups of 18 lactating Holstein cows were housed in two different free-stall pens and animals moved between pens according to a switchback statistical design. Free-stall treatments varied in dimensions, lunge space, and stall bed surfaces. Modern stalls (MOD) were wider (1.22m vs 1.14m), had taller stall dividers (1.22m vs 0.91m), and had improved forward and sideways lunge space compared to the older design stalls (OLD). MOD stalls had neck rails and plastic brisket boards located 1.68m from the curb while OLD had neither component. Stall bases were deep beds of sand (OLD) or sand over commercial rubber filled mattresses (MOD). Cows were assigned to pairs based on parity and DIM then randomly assigned to groups for 90 d. Animals switched housing treatments on d 31 and again on d 61. Cow behavior in the free-stall area was scanned every 10 minutes throughout the trial with wireless digital cameras. Behavior comparisons utilized data from the last 4 d of each period while milk production comparisons utilized the last 7 d. Means and SE for stall occupancy, resting, standing in stall, daily resting periods and cow comfort index were: 737±20 vs 688±19 min/d; 672±22 vs 615±20 min/d; 61±10 vs 73±7 min/d; 6.9±0.3 vs 7.9±0.4 events/d, and 91.4±1.3 vs 89.1±1.0 percent for MOD and OLD, respectively. Treatment differences were assessed by the Wilcoxon Two Sample Test (a non-parametric test). Cows spent more time occupying MOD stalls ($p<0.001$), more time resting in MOD ($p<0.001$), and had fewer daily resting periods ($p<0.001$) in MOD. Standing behavior (all four feet in stall or half-in/half-out) was significantly shorter in duration for MOD stalls ($p<0.007$). Cow comfort index (resting time divided by stall occupancy time) was significantly higher ($p<0.03$) for MOD stalls. Milk production was not influenced by switching cows between housing treatments ($p>0.5$). We conclude that modern stalls significantly enhanced cow comfort by increasing daily resting time and decreasing time spent standing in the free-stall. In this study, improved cow comfort did not lead to higher milk production.

Key Words: free-stalls, behavior

T181 The effects of cooling strategy and level of milk production on milk constituents and body composition quality traits during summer heat stress in lactating Holstein dairy cattle. H. Evans[1,2], J. Murphey[3], E. Cuadra[4], T. Dickerson[2], S. Gandy[2], S. Willard[2], and R. Vann*[1], [1]*Brown Loam Branch Experiment Station, Raymond, MS,* [2]*Mississippi State University, Mississippi State, MS,* [3]*Coastal Plains Branch Experiment Station, Newton, MS,* [4]*Alcorn State University, Alcorn State, MS.*

The metabolic demands of milk production often draw on body energy reserves to fulfill the requirements of lactation. These demands can be further intensified by the effects of heat stress, which alone can negatively impact production performance in lactating dairy cows. However, various cooling strategies can alleviate some of the detrimental effects of summer heat stress on metabolic processes and production performance. The objective of this study was to determine whether type of cooling system (Fan vs. Fan and Sprinkler) influences production performance, body composition (BC), and milk constituents (MC) in dairy cattle exposed to summer heat stress. Lactating Holstein cows (n=96) were assigned to groups (n=24/group) based on high (H; 28.0 ± 0.9 kg/d) and low (L; 21.8 ± 0.8 kg/d) milk production and cooling strategy as follows: H-Fan only (HF); H-Fan and Sprinklers (HFS); L-Fan only (LF); L-Fans and Sprinklers (LFS). Data was collected prior to milking every 14d over an 84-d period and included: respiration rate (RR; breaths/min), dorsal coat temperature using infrared thermometers (DIR; °C) and rectal temperature (RT; °C). Measurements by real-time ultrasound for BC consisted of percent intramuscular fat, gluteus medius depth and stress scores for IMF and GM muscle. Environmental temperature, relative humidity (RH), and temperature-humidity index were recorded daily throughout the trial. Milk samples were collected at 14-d intervals and analyzed for fat, protein, somatic cell count (SCC), and lactose. Cows in the HFS and LFS groups had lower ($P<0.05$) RT, DIR and RR than cows in the HF and LF groups. No differences ($P>0.10$) in MC were observed relative to level of milk production (H vs. L) for SCC and lactose, however protein and fat were lower ($P<0.01$) in H than L cows. Milk fat, protein, and SCC did not differ ($P>0.10$) between F and FS groups, however lactose was lower ($P<0.05$) in the F-only compared to the FS group. Body composition traits did not differ ($P>0.10$) between F and FS groups, however both GM stress and IMF stress were higher ($P<0.05$) in the H than L milk production groups. In summary, while cows in the FS groups were less affected by heat stress than cows in the

F-only groups, body composition traits and most milk constituents were not influenced by cooling strategy.

Key Words: Milk production, Holstein, Body composition

T182 Relationships between body condition score and peak milk in Holsteins. M. L. Theurer*[1], M. A. McGuire[1], and J. J. Higgins[2], [1]*University of Idaho, Moscow,* [2]*Standard Nutrition, Richland, WA.*

Two hundred fifty-two Holstein cows were assigned body condition scores (BCS) in the close up pen through mid lactation to evaluate changes in BCS and their relation to milk production. The cows were housed at three commercial dairies in central Washington. Two individuals assigned BCS on a 5 point scale by 0.25 points beginning about 14 d before parturition, continuing monthly until approximately 140 DIM, without knowledge of previous scores. Using the REG procedure of SAS, peak milk yield was regressed with close up BCS and change in BCS as independent variables. The mean close up BCS was 3.30 with a range from 1.88 to 4.63. Regression analysis determined that no relationship existed between peak milk and close up BCS or change in BCS. To further determine if BCS had any effect on peak milk production, cows were grouped for analysis into three groups by close up BCS $>$ 3.5, 3.0 $<$ close up BCS $\leq$ 3.5, close up BCS $\leq$ 3.0 (n = 65, 110, and 77, respectively) or change in BCS $>$ 0.75, 0.5 $<$ change in BCS $\leq$ 0.75, change in BCS $\leq$ 0.5 (n = 91, 73, and 88, respectively). Peak milk by close up BCS and change in BCS group was analyzed using the GLM procedure of SAS with LS means reported. Peak milk yield for the high, mid, and low close up BCS groups (46.6, 47.5, and 49.2 kg, respectively; SEM = 1.0) were not different ($P > 0.10$). Peak milk yield was not affected by change in BCS ($P > 0.10$) for high, mid, and low groups (48.9, 46.3, and 47.4 kg, respectively; SEM = 1.0). Close up BCS had no effect on peak milk production. Similarly change in BCS did not affect peak milk production. Peak milk production in Holstein cows is driven by factors other than close up BCS or body condition loss in early lactation.

Key Words: Body condition loss, Early lactation, Milk yield

T183 BeefSys: An interactive database program for on-going experiments and archival of livestock data. F. M. Rouquette, Jr.*, K. D. Norman, G. M. Clary, and C. R. Long, *Texas A&M University Agricultural Research & Extension Center, Overton, TX/USA.*

Efficient, effective, and sustained use of data depends on interactive use of current information and a method of archiving previously collected data. BeefSys was developed by the Texas Agricultural Experiment Station and the Texas Beef Initiative to provide a data storage site to accommodate all phases and relevant data on beef production including climate, soils, forage, and birth-to-harvest data. BeefSys resides on a computer which runs the Linux Operating System. The database software used to manage BeefSys is MySQL, which is the most popular open source database server and was designed for speed, power, and precision in mission-critical, heavy load use. BeefSys is not an open database, but rather offers a security code for the user who has exclusive use of specific records and can control other user access. BeefSys is accessed via the Internet using a web browser. Data can be downloaded into BeefSys from Excel, Access, etc. spreadsheet format or entered directly. All data input is backed up on external storage media on a routine basis. The user can retrieve very detailed data (ie: all calves of a particular cow including birthing and weaning data), or summary data (ie: average carcass traits of a breedtype for a 20-yr period that received supplement during the stocker phase). Currently, there are 70 fields in the expandable template. The initial data sets to test BeefSys consisted of more than 6,000 records for cow-calf, stockers, feeders, and carcass data collected during a 30-year period at TAMU-Overton. A secondary priority of data assessment included a 4-year multilocation grazing-feedlot-carcass experiment that included nearly 1,000 stocker cattle. The ability to archive databases from locations, statewide, or regionally offers one of the best uses of BeefSys so that data are not lost due to changes in user-project leaders as well as the continued use of multiple-year databases for modeling, economic, and biological assessments.

Key Words: Beef, Database, Production

T184 Contribution of manure and legume nitrogen to crop fertilization plans of Wisconsin dairy farms. B. J. Towns* and M. A. Wattiaux, *University of Wisconsin-Madison.*

Producers should be encouraged to maximize the use of manure and legume nitrogen (N) to limit fertilizer purchases and risks of environmental pollution. Our objective was to determine the N-credit, that is, the contribution of manure and legume N to total crop N needs on mixed dairy/cropping operations, assuming producers fertilize crops according to current guidelines. Descriptive data were collected for nine farms using solid manure (SM) handling systems and nine farms using liquid manure (LM) systems for years 2000 and 2001. Cows, hectares (ha), and animal units (AU) were 91±10, 136±36, 184±27 and 611±101, 482±101, 929±144 for SM and LM farms, respectively. A "de-facto" N credit (kg/ha) was calculated as: (Total Crop N Recommended - Imported Fertilizer N)/N-Requiring Ha. A de-facto N credit (%) was calculated as: (Total Crop N Recommended - Imported Fertilizer N)/Total Crop N Recommended. University of Wisconsin-Extension guidelines were followed to calculate crop N recommendations. The de-facto estimates represent crop N supplied by sources other than imported fertilizer. Despite large differences in AU for SM and LM farms, AU/N-Requiring Ha were similar and averaged 4.8±1.2 and 4.5±0.7, respectively. De-facto N credit for all operations was 115±12 kg/N-Requiring Ha or 68±7% of total crop N recommendations. There was no difference (P>0.10) between the SM and LM farms as de-facto N credits were 71±8% (117±12 kg/N-Requiring Ha) and 65±12% (113±21 kg/N-Requiring Ha) of the total crop N recommendations, respectively. Imported fertilizer averaged 48±38 and 57±58 kg N/N-Requiring Ha for SM and LM farms, respectively. De-facto N credit was not correlated with cows, AU, N-Requiring Ha, or total hectares. This research indicates that producers rely heavily on manure and legume N in their crop fertilization plans because imported fertilizer accounted for only 32% of total crop N recommendations. Contributions of manure and legume N as crop fertilizer were similar between small producers on SM systems and large producers on LM systems.

Key Words: Manure credits, Legume credits, Dairy

T185 Impact of manure application timing in dairy pastures on the migration of nitrates to groundwater. T. Downing*, B. Lambert, and M. Gamroth, *Oregon State University.*

Manure application to pastures is a common management practice among dairy farmers. Manure application can increase pasture crop production and minimize manure storage and handling costs. The amount and timing of these manure applications may be important because of agronomic and environmental implications. Excess nitrogen, not absorbed by the pasture vegetation can leach past the root zone and into groundwater. High nitrate levels in groundwater can lead to health risks. A year-long study was conducted on grazing pastures at two dairies to monitor potential nitrate movement from the surface through the soil profile toward groundwater. Precipitation, irrigation, manure application, and grazing were compared to nitrate movement. Both sites were planted in cool season perennial pasture, comprised of rye grass and orchard grass. Both pastures were part of rotational grazing systems and receive periodic applications of manure by cattle and by typical manure application equipment. Sampling devices were located in the center of operational fields. A total of nine sampling wells (lysimeters) were installed at depths of 1, 1.3, and 1.6 m below the surface of each pasture. Each depth was replicated three times at each site. Water samples were taken every two weeks at each site and tested for nitrate-N. Manure application, forage harvests, and commercial fertilizer applications were recorded. Rainfall measurements were estimated using local weather data. Farm A applied a total of 600 kg N/hectare throughout the year while farm B applied approximately 300 kg. Farm A nitrate values averaged at 15.2 ± 12.2 ppm, 6.5 ± 6.9ppm and 2.9 ± 3.6 ppm at 1, 1.3 and 1.6 m respectively. Farm B nitrate values averaged 13.8 ± 8.5 ppm, 8.5 ± 5.7 ppm, and 1.3 ± 2.9 ppm at 1, 1.3 and 1.6 m. No relationship between farming activity and nitrate movement was noted. In addition, irrigation appeared to have no influence on nitrate movement. Substantial rainfall (>15 cm per two week period) appears to be the major factor in nitrate movement.

Key Words: Nitrate, Nitrogen leaching

T186 Effect of trucking density and transport time of market pigs on behavioural pattern during transport, plasma concentrations of stress-related biochemical markers and carcass quality. J. H. Woo, D. M. Ha, C. Y. Lee, and D. H. Kim*, [1]*Regional Animal Industry Research Center, Jinju National University*.

A total 114 market pigs weighing approximately 110 kg were transported to a local abattoir for 1 h or 3 h under a high (H; 0.34m/100 kg BW)-, medium (M; 0.38m)-, or low (L; 0.42m)- trucking density, under a 2 (transport time) x 3 (trucking density) factorial arrangment of treatments. Behavioural pattern of the pigs during transport were video-taped. Blood samples were taken at slaughter, after which Longissimus Dorsi muscle (LM) was taken for physicochemical analysis following overnight chilling of the carcass. Most of the pigs stood during transport at H-trucking density, whereas at M- or L-density, a substantial percentage of the pigs sat or lied. Plasma glucose concentration was greater ($P<0.05$) in the 3 h-transport group than in the 1 h-transport; lactate dehydrogenase concentations were less in the L-density and 1 h-transport than in M- or H-density and 3 h-transport groups, respectively. The lightness (L* value) of LM, which exibited no main effect, was affected ($P<0.01$) by a density x transport time interaction. The incidence of PSE (pale, soft and exudative) carcass was less in 1 h-transport group than in 3 h-transport group at H- (23.5 vs 29.4%) and L-density (11.5 vs 26.9%), but not at M-density (14.3 vs 14.3%). It is concluded from these results that a short transport within 1 h at L-trucking density is desiable in terms of animal welfare. However, under practical situations, M-density trucking density may be the most economical.

Key Words: Pig, Transport, Stress

T187 Exposure to short days during the dry period increase milk production in subsequent lactation in dairy goats. S. J. Mabjeesh*[1], A. Shamay[2], G. E. Dahl[3], and T. T. McFadden[4], [1]*The Hebrew University of Jerusalem, The Faculty of Agriculture, Israel,* [2]*The Volcani center, Agricultural Research Organization, Israel,* [3]*University of Illinois, Urbana,* [4]*University of Vermont, Burlington*.

The effect of long day photoperiod (LDPP) or short day photoperiod (SDPP) during late gestation on subsequent milk yield was examined under thermoneutral conditions (23±1 °C; NT). The experiment was conducted on 4 goats in each group, which were held on metabolic crates in fully controlled rooms. The LDPP treatment group was held in 16 h light: 8 h dark and the SDPP in 8 h light: 16 h dark cycles in 70% relative humidity atmosphere. Blood samples were collected every 5 d until week 12 after kidding to assess concentrations of IGF-I and PRL. After kidding, goats were held in outdoors yards and had the same management like the other goats on the farm. Goats were milked twice daily and milk samples were taken every 7 days and analyzed for milk components. Milk production was measured automatically by flow meters.Milk yield was higher in the SDPP group by 26% compared to the LDPP for the 12 weeks post kidding (2932 vs 2320 g/ d, $P< 0.001$, SE = 105). Plasma prolactin concentration was higher in the LDPP group from week 6 prior to kidding compared to SDPP and averaged 169 and 112 ng/ ml ($P< 0.005$, SE = 11). However, prolactin concentration across the 12 weeks post kidding was similar for both groups and averaged 13411.9 ng/ ml. Similar profile was measured to IGF-1 concentration. IGF-1 concentration averaged 0.177 ng/ ml compared to 0.073 ng/ ml ($P< 0.001$, SE = 0.01) in the LDPP and SDPP groups, respectively. After kidding IGF-1 concentration was 0.075±0.01 ng/ ml for both treatments. These results are the first to demonstrate the effect of photoperiod during the prepartum period on subsequent lactational performance in dairy goats. These results further confirm the association of LPDD with higher prolactin and IGF-1 in plasma prepartum. It is believed that the sensitivity of the mammary gland to prolactin during the dry period or early in postpartum is the mechanistic explanation for the higher milk production observed in SDPP.

Key Words: Milk production, Dairy goats, Photoperiod

Forages & Pastures

T188 Forage mineral concentrations in West Virginia pastures. E. B. Rayburn, W. L. Shockey*, and R. M. Wallbrown, *West Virginia University, Morgantown, WV*.

Mineral nutrition of grazing livestock is directly related to pasture mineral concentration. Livestock mineral intake varies because pasture forage species are not constant, fertilizer application varies, and most pastures are not tested for mineral content. An evaluation of pasture mineral status was conducted over 5 years (1997 through 2001) and involved the cooperation of 17 extension agents in 18 counties. Objective was to develop a livestock mineral supplement that would insure adequate mineral intake for livestock grazing West Virginia pastures. Data represents over 105 site-years with monthly samples taken randomly from selected farms from May to September. Forage samples were analyzed by commercial laboratory for protein, fiber, and mineral concentration. Mineral concentration mean and 10, 50 and 90 percentile values were Ca 0.68, 0.44, 0.65, 0.96; K 2.46, 1.76, 2.46, 3.21; Mg 0.25, 0.17 0.24 0.33; P 0.34, 0.23, 0.34, 0.46; S 0.24, 0.17, 0.24, 0.32; Al 254, 48, 154, 522; Cu 10.9, 7.0, 10.0, 15.2; Fe 403, 124, 253, 792; Mn 110, 54, 93, 194; Mo 1.08, 0.30, 0.88, 2.08; Na 0.237, 0.009, 0.020, 0.070; and Zn 34.7, 20.0, 27.8, 47.0, respectively. Concentration vs probability percentile was calculated for each mineral to determine the % of time pastures were below a given animal nutrient requirement. By comparing an acceptable risk level (for example the 10th percentile) to the animal's mineral requirement, a mineral supplement requirement can be calculated that should ensure that 90% of the animals consuming the supplement would meet NRC established requirements. Most pastures in West Virginia are adequate for average producing cattle used in a cow/calf production system, the primary pasture use in the state. Where animals of above average production ability are desired, above average management is needed to provide adequate forage quantity and quality over the grazing season.

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T189 The effects of irrigation of soil and stage of harvest on mineral contents of grasslands located at high altitude. A. Hayirli*[1], I. Kaya[2], K. Haliloglu[3], and B. Karademir[4], [1]*Dept. of Animal Nutrition, School of Veterinary Medicine, Ataturk University, Erzurum 25700, Turkey,* [2]*Dept. of Animal Nutrition, College of Veterinary Medicine, Kafkas University, Kars 36100, Turkey,* [3]*Dept. of Agronomy, College of Agriculture, Ataturk University, Erzurum 25100, Turkey,* [4]*Dept. of Internal Medicine, College of Veterinary Medicine, Kafkas University, Kars 36100, Turkey*.

In this study, the effects of soil irrigation and maturity stage on mineral concentrations were evaluated on 4 irrigated and 4 non-irrigated grasslands located at altitude of 2100 m. Grasslands were irrigated for one week and composites of plant subsamples (n = 10) from each grassland were pooled by cut with 14-d interval (n = 5) between May 21-July 30, 1999. The model included main effects of soil irrigation and maturity stage and their interaction in 2-way ANOVA. Irrigation did not affect soil pH (6.92), and clay (28.84%), sand (39.14%), OM (6.69%), K (50.60 Meq/g), Ca (1.22%), Mg (3.17 g/kg), Al (0.05 ppm), Ba (1.27 ppm), Co (0.07 ppm), Cu (1.82 ppm), Fe (6.59 ppm), Li (0.09 ppm), Mn (8.14 ppm), Zn (0.38 ppm), and Sr (2.54 ppm) levels. However, concentrations of Na (109.6 vs. 39.9 mg/kg), P (19.1 vs. 4.68 g/kg), Cd (0.02 vs. 0.001 ppm), Cr (0.09 vs. 0.001 ppm), Ni (1.62 vs. 0.97 ppm), and Pb (0.39 vs. 0.07 ppm) were greater in irrigated soils than non-irrigated soils. Concentrations (ppm) of Mn (79.62), Al (472.6), B (8.27), Ba (4.55), Cr (1.90), Cu (2.44), Fe (397.7), Li (9.19), Se (0.81), and V (4.20) in plants were not affected by irrigation. However, concentrations of plant K (262.6 vs. 220.8 Meq/g) P (3.24 vs. 2.62 g/kg), Mg (1.71 vs. 1.47 g/kg), S (555 vs. 529 g/kg), Na (0.87 vs. 0.52 g/kg), and Zn (19.09 vs. 13.52 mg/kg) were greater and Ca (4.18 vs. 5.60 g/kg) and Sr (6.71 vs. 12.11 mg/kg) levels were lower in irrigated grasslands than non-irrigated grasslands. There was no effect of stage of maturity on plant Mg, S, Mn, Na, Al, B, Ba, Ca, Cr, Fe, Li, Se, and V levels. There were linear decreases in concentrations of plant K from 258.8 to