horse owners, breeders, agribusiness, government agencies and the general public. Agricultural/equine press usage of articles from the web site indicates the value of these materials and its easy and rapid access.

Key Words: Horse, Internet, Extension Programs


Less than 2% of the U.S. population is currently involved in agriculture and many young people have little or no experience with farm animals. We need young people to continue to chose agricultural careers, but also, as adult consumers, to make intelligent choices and policies about issues involving the use of animals for food and fiber. We have developed a program that begins with a PowerPoint slide show describing ruminant animals. The Powerpoint includes images of a variety of ruminant animals that the students may have seen on television or in zoos. We describe how a ruminant is able to use grass with the aid of slides and other props. The presentation is geared to the level and experience of the youth group. These groups range in age from 6 to 18 years and from no animal experience to farm youth. Because these audiences learn best from hands-on experiences, they are invited to handle a rumen- fistulated cow, offer her feed, and explore the rumen. The youth are given lab coats and gloves and can place their arm inside the cow. The program includes the use of a microscope for viewing rumen microflora and a feed demonstration. In this way, participants can see, feel and smell what we have talked about, reinforcing their learning experience. When appropriate, the program also includes discussion of possible careers in animal biology and production. Last year 10 demonstrations were conducted for approximately 350 young people and their chaperones. The program has Institutional Animal Care and Use Committee Approval. Many of the groups bring new students each year. The cow is a critical component of the success of this program.

Key Words: Agricultural Education, Youth

558 Healthy farms=healthy agriculture: A new approach to biosecurity education. J. M. Smith*, University of Vermont, Burlington.

The University of Vermont entered into a special cooperative agreement with the United States Department of Agricultures Animal and Plant Health Inspection Service in 2002 to distribute biosecurity materials relevant to ruminant livestock production. The original objectives were to develop, produce, and distribute information on (1) biosecurity measures that all personnel, salespeople, consultants, and visitors should follow when entering farm animal premises and (2) measures to follow when bringing animals, especially those of unknown origins, onto existing farms. These objectives were modified during the planning process involving various stakeholders. The stakeholders helped identify our target audiences and the types of information they needed. We concluded that farm owners are responsible for the biosecurity measures practiced on their farms by themselves and their employees, as well as by the agri-service personnel, salespeople, and others who enter the premises. So the materials were designed to be distributed to and used by farmers. In addition to biosecurity procedures for people and new or returning animals, we decided to cover measures to reduce the biosecurity risks posed by wildlife. The title was chosen so as to not be alarming. The main outputs of the project were a professionally-printed, 3-ring binder with about 100 pages of information, a compact disk of the same information adhered inside the back cover, and a web site (www.uvm.edu/~ascbiotics/) where the information was posted. Tabbed dividers were labeled introduction, assessment, new animals, visitors, wildlife, biosecurity practices, diseases, and appendix. Our goal was a well-organized collection of existing information, reformatted to make it easy for farmers to understand and apply. Sixteen reviewers, who included veterinarians, extension faculty, agri-service personnel, and farmers, made comments on drafts of the materials. The finished binder was distributed to all ruminant and dairy farms listed with the Vermont Agency of Agriculture, Food, and Markets in fall of 2003. A video was also planned but not completed by the end of the one-year project period.

Key Words: Biosecurity, Extension

559 An environmental assessment tool for poultry farms developed as part of environmental management systems. P. H. Patterson*, L. E. Lanyon2, and A. H. Mende1, 1Department of Poultry Science, The Pennsylvania State University, University Park, 2Department of Crop and Soil Sciences, The Pennsylvania State University, University Park, 3PennAg Industries Association, Harrisburg, PA.

Environmental Management Systems (EMS) for the poultry industry address environmental policy with continuous improvement to ultimately achieve regulatory compliance and pollution prevention. As part of the 9-state Partnership for Livestock Environmental Management Systems project, a team of industry, government and university stakeholders developed an assessment tool for the commercial layer, broiler and turkey industries in Pennsylvania (PA). The goal of the tool was to set environmental priorities, to evaluate environmental protection measures, to communicate and monitor environmental performance. It was adapted from national and existing PA Farm*A*Syst materials, and field-tested on 10 layer, 10 broiler and 10 turkey farms. Eleven priority areas were evaluated for risk on a scale from 1-low to 4-high risk including: drinking water supply, septic design and operation, run-off issues, mortality management, farm nutrient balance, emergency action planning, and more. Example average scores for drinking water supply were: 1.7 layers, 1.7 broilers, 1.4 turkeys, however, the range of scores were 1-2.3, 1-4 and 1-4, respectively, indicating improvement opportunities. Other opportunities were identified for pest, odor and dust management (broilers), mortality management (turkeys) and farm nutrient balance (layers). Survey responses by producers indicated the tool was helpful to their operation, the experience raised awareness, 75% preferred the 3rd party assessment to self-assessment, and 1/3 were interested in pursuing an EMS. An important lesson from the pilot was that producers have little time and a concise, timely assessment was essential. The tool was effective in documenting performance and identifying opportunities. It has been proposed for adoption as the poultry component of PEACCE, a state-wide certificate program for environmental excellence and stewardship in animal agriculture.

Key Words: Poultry, Environmental Assessment, EMS

Forages and Pastures: Harvesting and Grazing Management of Forages

560 The effects of total non-structural carbohydrates (TNC) on voluntary intake of goats and digestibility of gamagrass (GG) harvested in the morning (AM) or afternoon (PM). A. Sauve1, G. Huntington1, and J. Burns1,2, 1North Carolina State University, Raleigh, 2USDA, ARS.

The objective was to evaluate the differences in TNC of Iuka GG (Tripsacum dactyloides L.) harvested at 0530 (AM) or 1730 (PM), and to measure how TNC concentration and CP supplement affect the voluntary DMI and digestible DMI (DDMI) of GG field-cured and stored in square bales. Boer X Spanish wethers (24 ± 3 kg) were randomly assigned to supplement (SP, 31% CP, fed at 11% of DMI, 14 goats) or no supplement (14 goats). Within SP or no SP, goats were randomly assigned to a crossover design of AM GG (7 goats) or PM GG (7 goats). Goats were individually housed in metabolism crates with free access to water and mineral blocks. They were fed twice daily, with SP being offered once a day 30 min before morning feedings. After a 7-d adaptation, voluntary intake (goats were fed 110% of previous days intake) was measured for 14 d, followed by a 4-d adjustment (to equalize DM offered between periods) and a 5-d digestion trial to measure DM digestibility (DMD). After Period 1 the goats were switched to their new diets, and the protocol was repeated. GG concentrations were g/kg DM and intakes are g/d. Means differ at P < 0.03. Compared to AM, the PM harvest had greater TNC (72.5 vs. 59.1), monosaccharides (37.3 vs. 27.5) and di- and polysaccharides (15.4 vs. 13.3). The DMD was greater for PM vs. AM (56.0 vs. 53.6%) and for SP vs no SP (57.0 vs. 52.7%). Crude protein (92) and starch (19.1) were similar (P = 0.98) for PM and AM. Compared to no SP, SP increased total DDMI(DMI times DMD from the digestion trial)during the voluntary intake phase(344 vs. 305) and

digested trial (337 vs. 292). However, GG DMI was not affected (P > 0.17) by SP during the voluntary intake phase (531 vs. 571) or digestion trial (522 vs. 554). Voluntary GG DMI (552 vs. 551, P < 0.089) and voluntary total DDMI (331 vs. 318, P < 0.14) were similar for PM and AM; however, total DDMI during the digestion trial was greater for PM vs. AM (325 vs. 304). We conclude that PM GG had a greater DMI and DDMI than AM GG due to increased TNC and not due to differences in intake by the goats. Supplementation had small effects on DMI and DDMI of GG.

Key Words: Gamagrass, Meat Goats, Carbohydrates

561 Afternoon harvest increases readily fermentable carbohydrate (CHO) concentration and voluntary intake of gamagrass (GG) and switchgrass (SG) baleage fed to beef steers. G. Huntington1, J. Bums1,2, 1 North Carolina State University, Raleigh, 2 USDA,ARS.

Our objective was to determine if AM (0600) vs. PM (1800) harvest affects CHO composition and voluntary intake of GG or SG stored as baleage. Iuka GG (Tripsacum dactyloides L.) and Alamo SG (Pan- scum virgatum L.) were direct-cut and stored as baleage in round bales wrapped in plastic. Black steers (260 ± 16 kg BW) were assigned (5 steers per treatment) to GG/AM harvest, GG/PM harvest, SG/AM harvest, or SG/PM harvest. Steers were group-housed in covered, outdoor pens with individual feeding gates. After adaptation to the facility (5 steers per treatment) to GG/AM harvest, GG/PM harvest, SG/AM harvest, or SG/PM harvest. Steers were adapted to the facility for three dates in Spring and samples of 2 kg were harvested at 7-14 day intervals for chemical analyses and in vitro and in sacco incubations by cutting to 5 cm above soil level. An important aspect of this experiment was the use of the fresh mincing procedure to provide material for in vitro and in sacco incubations which mimicked cow digesta. Composting offers a rapid and inexpensive method in vitro incubations which mimicked cow digesta. Composting offers a rapid and inexpensive method of measuring rate of passage and microbial utilisation. One effect of maturation was a brief period of ammonia surplus followed by insufficiency for microbial growth, but the rate and amounts of VFA produced were not affected by forage CP content or ammonia concentration. Maturation had little effect on proportions of VFA. The hypothesis was proven in part; maturation did alter rates of degradation but products of digestion were less affected by maturation and the proportion of N degraded was similar for all maturities.

Key Words: Forage Maturity, Ryegrass, Nutritive Value

563 Effects of beef cow grazing management on sediment and phosphorus losses from smooth brome grass pastures. M. Haan1, J. Russell1, W. Powers1, S. McMickel2, R. Schultz2, and J. Kova2, 1 Department of Animal Science, Iowa State University, Ames, 2 Department of Agricultural and Biosystems Engineering, Iowa State University, Ames, 3 Department of Natural Resource and Environmental Management, Iowa State University, Ames, 4 USDA-National Soil Tilth Laboratory, Ames, IA.

To determine the impacts of grazing management on phosphorus (P) and sediment losses to surface waters five-pasture management systems were evaluated. For 3 yr, three smooth bromegrass pastures with slopes of up to 15° were divided into five 0.4-ha paddocks that were grazed by Angus cows (mean BW 632 kg). Grazing treatments included: an ungrazed control (U), summer hay harvest with winter stockpiling grazing to a residual sward height of 5 cm (HS), continuous stocking to a residual sward height of 5 cm (SC), rotational stocking to a residual sward height of 10 cm (10R). In the late spring, mid-summer, autumn and early the subsequent spring of each year, rainfall simulations were conducted at 6 sites within each paddock, 3 at high slopes (7.5 to 15.0°) and 3 at low slopes (0 to 7.5°). Rainfall simulators dripped at a rate of 7.1 cm/hour over a 0.5-m² area for a period of 1.5 hours. Runoff was collected and analyzed for total sediment, total P, and total soluble P. Simultaneous to each rainfall simulation, measurements were taken of ground cover, penetration resistance, surface roughness, slope, soil P, soil moisture, sward height and forage mass. There was no difference in the amount of sediment in runoff across treatments. Of the variables measured, amount of sediment in the runoff was most highly correlated with percent ground cover (r² = 0.16). The 5R and 5C treatments contributed the greatest amount of total and soluble P (p < 0.05) to runoff. The 10R and HS treatments were intermediate, and the U treatment contributed the smallest amounts. High slope areas had greater surface runoff (p < 0.05) and greater sediment flow (p < 0.05) than did low slope areas. Forage management practices that leave greater forage residue on the pasture will reduce the amount of P potentially lost to surface waters in runoff. Pastures with high slopes are more sensitive to losses of sediment in runoff and may need to be stocked less intensively than pastures with low slopes.

Key Words: Grazing, Phosphorus, Water Quality

564 Apparent nutrient digestibility and ruminal alterations in beef steers consuming bermudagrass hay and supplemented with soybean hulls and(or) corn. J. C. Henley*, A. I. Orr, and B. J. Rude, Mississippi State University, Mississippi State.

Six ruminally fistulated steers (initial BW = 266 ± 36.9 kg) were utilized in a digestion trial to evaluate the performance of steers consuming soybean hulls and(or) corn while consuming bermudagrass hay. The steers were randomly allotted to one of three supplement groups: 1) soybean hulls (SBH); 2) 75% SBH + 25% corn (MIX); 3) corn (CORN). There were three collection periods of five days each. Prior to each 5-day collection period, steers were adapted to their diets for 4 days and then weighed to their individual stalls for an additional three days. Steers were housed in stalls for ten days per period (3 day adaptation, 5 day collection, 2 day in situ collection). All steers were fed their respective supplement at 1.5% BW at approximately 0800 each day and had ad libitum access to bermudagrass hay throughout the trial. There were no differences (P > 0.05) among treatments for dry matter, organic matter, or crude protein apparent digestibilities. However, steers consuming SBH and MIX had greater (P < 0.05) apparent digestibility of NDF (64.9 and
62.7%, respectively), ADF (65.4 and 63.2%, respectively), and hemicel-
lulose (64.0 and 61.8%, respectively) compared to steers fed corn (51.9,
48.7, and 55.0%, respectively). No differences (P > 0.05) were found for
total VFA or individual VFA concentrations among treatments. How-
ever, isobutyrate and isovalerate as a percentage of total VFA decreased
(P < 0.05) with time after steers consumed their supplement. Valer-
iate concentrations increased (P < 0.05) for approximately 6 hours after
consuming supplements, and then decreased by 8 hours post consump-
tion. Ruminal pH decreased (P < 0.05) from 6.93, 6.85, and 6.80 for
CORN, SBH, and MIX, respectively to 6.30, 6.11, and 6.05, respectively.
Supplementing steers with soybean hulls was not affected by addition of
corn. However, supplementing with corn decreased fiber digestion. Use
of soybean hulls as a supplement may improve animal fiber utilization
compared to corn only when consuming hay.

Key Words: Soybean Hulls, Supplementation, Digestibility

656 Evaluation of different backgrounding pro-
grams for weaned beef calves. K. H. Hunter*, A. M. M. Shank,
R. K. Shanklin, W. S. Swecker, J. P. Fontenot, G. Scaglia, and C. L.
Pickworth, Virginia Polytechnic Institute and State University, Blacks-
burg.

Sixteen trials were conducted during 4 yr with 716 animals (552 steers
and 164 heifers) (approximately 200 steers) to evaluate the effects of various
regimens on performance and health during the backgrounding period
(42 d) from weaning to stocker. Thirteen trials were conducted on
pasture and three in drylot. All trials had a minimum of two replicates.
Grazing trials were on stockpiled fescue-based pastures, and fescue hay
was fed in the drylot trials. Grazing calves were fed different supplemen-
tations with CP levels of 15, 16, 17.4, and 30% at rates of 0.5, 1.0,
1.5, and 2.0 kg of BW in different trials. Supplements included corn + SBM, soy hulls +
SBM, corn gluten feed + soy hulls, alfalfa pellets, and a 50% hay mix-
ture. Data for all trials were analyzed using the GLM procedure for
analysis of variance for a completely randomized block design. Tukey’s
one way analysis of variance test was used to compare treatment and
forage type effects and interactions. Usually, supplemented calves had
higher ADG (P < 0.05) than un-supplemented calves. Similar ADG were
observed when supplementation was provided at 0.5 and 1.0% BW (P
> 0.05), suggesting that supplementation of calves at more than 0.5% BW
is not advantageous. Similar gains were observed across all grazing trials
with supplementation at 15, 16, 17.4, and 30% CP levels. Cattle supple-
mented with by-product feedstuffs (corn gluten feed + soy hulls and
soy hulls + SBM) performed comparably to those supplemented with
corn + SBM (P > 0.05). There were no differences in ADG between
unsupplemented animals grazing either fescue pastures or fescue-alfalfa
pastures. In drylot, animals supplemented with concentrate had higher
ADG (P < 0.05) than unsupplemented animals. Low levels of protein
supplementation improves performance of calves grazing stockpiled for-
age.

Key Words: Beef Cattle, Forages, Backgrounding

656 Impact of stocking rate and stocking strategy
on gain per animal and gain per hectare of steers grazing
rotational or continuous stocked rye-ryegrass pasture. J.J.
Cleere*1, F.M. Rouquette, Jr.1, and G.M. Clary2. 1Texas Agricul-
tural Experiment Station, Overton, 2Texas Cooperative Extension, Overton.

Selecting appropriate stocking rates for winter annual pastures used
for stocker cattle requires knowledge about the environment and for-
growth attributes as well as management experience. Sod-seeded
Maton rye and TAM 90 annual ryegrass pastures were grazed by Bon-
smara x Beefmaster steers from December 18, 2002 to May 14, 2003 to
quantify effects of stocking rate (SR), stocking method (SM), and stock-
ning strategy (SS) on gain per animal and gain per hectare. Replicate
pastures (n = 2) with (n = 4) steers each were used for each of the follow-
ing treatments: 1) Stocking Rates; Low (LO, 2.5-238 kg steers/ha
initially) and Medium (ME, 4.9-238 kg steers/ha initially). 2) Stocking
Methods; Continuous (CN) and eight-paddock Rotation (RT, 2-d res-
idence and 14-d rest). 3) Stocking Strategies; Fixed SR (FX, SR was
fixed during the entire grazing period) and Variable SR (VR, initial SR
were fixed until early March and then both LO and ME SR were in-
creased to 7.4 hd/ha until termination). Animal ADG ranged from 1.22
to 1.28 kg/d for all low stocked pastures with no differences across SM
or SS. Effects of stocking treatments on ADG became more apparent
at ME stocking rate with the RTVR exhibiting 0.17 kg lower ADG (P
= 0.02) than the CNFX steers (CNFX = 1.18, CNVR = 1.14, RTFX
= 1.05, and RTVR = 1.01 kg/d). The slight decline in ADG with VR
strategy compared to FX was likely due to reduced forage availability
in late spring. Differences in gain per animal were not detected between
FX and VR at any one stocking rate with the exception of a difference in
the ME-CNFX and ME-RTVR (152 vs 129 kg; P = 0.02). This may in-
dicate that increased stocking via VR strategy in early March increased
forage utilization with little negative impact on gain per animal. Gain
per hectare ranged from 426 kg/ha on the LO-FX for both CN and RT
v 84 kg/ha on ME-CNVR and 853 kg/ha on ME-CNVR. The opportu-
nity to increase stocking rate on the rye-ryegrass pastures during spring
increased forage growth can double the gain per hectare.

Key Words: Stocking Rate, Pasture, Animal Gain

567 Accuracy of intake measurements for cows
grazing grass/legume pastures using the alkane marker
technique. G. C. Waggon*, S. L. Woodward, and D. A. Clark,
Dexcel Limited, Hamilton, New Zealand.

Measurement of feed intakes of individual cows grazing perennial rey-
grass (Lolium perenne L.) based pastures in New Zealand has favored
use of alkane markers, in part because forage digestibility is not required
for intake calculation. Estimates of DMI are based on recovery of odd
chain length (C31 and C33) plant cuticular waxes (alkanes) in conjunc-
tion with twice daily administration of a synthetic even chain (C32) alkane
marker. However, some researchers have expressed concern over the
accuracy of intake estimation. Implicit in this methodology is an
equal recovery of all alkane used in calculations of intake. Results of
indoor trials with lactating cows and some supporting data from sheep
are presented to demonstrate unequal recoveries of individual alkane
fro fes. Intake calculations presented here use pasture C31 and
twice daily doses of C32 to estimate intakes. In a trial with 16 cows
grazing and given a C32 marker, mean actual daily DM intake (y)
10.7 kg dry matter (y) 1.09 (mean ± SD) was lower than predicted from
alkane (x) 11.2 kg ± 1.37; where y = 0.66x + 3.28, r2 = 0.68. The mean actual
daily DM intake (y) of 15 cows in a separate trial (Trial 2) fed fresh
pasture indoors with total faecal collection was 12.0 kg ± 1.19 com-
pared to predicted (x) values of 10.35 kg ± 1.06; where y = 0.77x ±
1.15; r2 = 0.75. Recovery (%) of intake from C31, C32 and C33 from
total collection of faeces in Trial 2 differed, averaging 89 ± 10.5, 101 ± 10.6
and 97 ± 15.2 respectively. Comparable values from total collection of
faeces from separate groups of six sheep were 92 ± 7.1, 80 ± 6.6 and 83
± 8.1 for pasture diets; 100 ± 7.5, 106 ± 10.3 and 90 ± 9.2 for alfalfa
diets and 73 ± 12.5, 95 ± 14.8 and 57 ± 12.3 for white clover diets.
The differences between faecal recovery of specific alkane preclude an
accurate prediction of intake and the standard deviations demonstrate
large variations in recovery between animals. Inconsistent and contrast-
ing alkane recovery will limit their use for estimating intakes of cattle
grazing pastures.

Key Words: Alkane Markers, Pasture, Intake
the median intercept was identified using the pooled slopes and compared to all other ST intercepts. Seven ST were not different (P > 0.05) from the median intercept with an average geometric intercept (GI) of 0.20 (AZ, CA, KA, MN, OR, PA, WA). Three ST had a higher average GI of 1.00 (UT, ID, NE), two ST had a lower GI of 0.95 (IL, NY) and two ST had the lowest GI of 3.08. Average GI weighted for the observations in each group was -1.19. The slope of ADF versus NDF appears constant throughout the US and variation in intercepts is more likely related to laboratory differences rather than to regional differences in alfalfa. In conclusion, it is possible to identify a geometric relationship between ADF and NDF that can be used to develop uniform alfalfa hay quality guidelines for the US: ADF = -.19 + .80*NDF; n=605, R²=.90, and RMSE=1.7.

**Key Words:** Fiber, Forage Quality, Alfalfa

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**569 Effects of purified fiber energy supplementation on digestion and ruminal parameters of steers fed cool season grass hay.** H. M. Blalock* and C. J. Richards, The University of Tennessee, Knoxville.

Six ruminally and duodenally cannulated steers were arranged in a replicated 3 x 3 Latin square. Steers had free choice access to cool season grass hay and were supplemented with 0 (NO), 0.25 (LO) or 0.50% (HI) BW of purified fiber (60% solka floc, 40% oat fiber) prior to AM hay feeding. Periods were 18 d. On d 7 to 17, steers were intra-ruminally dosed with Cr₂O₃ followed by total fecal collection from d 12 to 17 and duodenal digesta sampling at 10 hr intervals on d 13 to 17. On d 17, Co-EDTA was ruminally dosed and rumen fluid collected at 0, 3, 6, 9, 12 and 24 hr post-dosing. On d 18, ruminal contents were evacuated, weighed and subsamples retained for bacterial separation. Forage intake and total N intake were not affected by supplementation. Total intake of DM, NDF, ADF and OM were increased (P < 0.05) with increased supplementation. Quantities and percentages of total trit DM, NDF, ADF and OM digestion were increased (P < 0.05) by supplementation. Ruminal and total tract nitrogen digestion were not affected by supplementation. Ruminal acetate and propionate concentrations were not affected (P > 0.10) while butyrate concentrations increased (P < 0.01) with supplementation. Isobutyrate, valerate and isovalerate concentrations decreased (P < 0.01) with supplementation. However, isobutyrate was not different between HI and LO. Ruminal pH was greatest (P < 0.01) for HI. Ruminal NH₃-N concentrations were decreased (P < 0.01) by supplementation. A TK x Time interaction existed (P < 0.01) for NH₃-N due to the concentration of NO remaining relatively constant throughout the 24 hr period. Total N flow at the duodenum was not affected by supplementation. This data indicates that supplementing steers consuming cool season grass hay with fibrous energy can increase ruminal and total tract fiber digestion without affecting forage intake.

**Key Words:** Fiber, Digestion, Ruminate

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**Nonruminant Nutrition: Amino Acids**

**570 The optimal true ileal digestible lysine and total sulfur amino acid requirement for nursery pigs between 10 and 20 kg.** J. D. Schneider*, M. D. Tokach, S. S. Dritz, R. D. Goodband, J. L. Nelsen, J. M. DeRouchey, C. W. Hastad, N. A. Lenehan, N. Z. Frantz, B. W. James, K. R. Lawrence, C. N. Groesbeck, R. O. Gottlob, and M. G. Young, Kansas State University, Manhattan.

An experiment involving 360 pigs (avg BW = 10.3 kg) was conducted to determine the appropriate true ileal digestible (TID) lysine and total sulfur amino acid (TSAA) requirement of nursery pigs, and consequently to determine the optimal TSAA:lysine ratio. This trial was organized as a combination of two separate experiments with one set of diets consisting of five treatments with increasing TID lysine (0.9, 1.0, 1.1, 1.2, and 1.3%) and the second set of diets consisting of five treatments with increasing TID TSAA (0.56, 0.62, 0.68, 0.74, and 0.81%). The highest level of both lysine and TSAA (1.3 and 0.81%, respectively) served as a positive control and this diet was combined as one treatment to give a total of nine treatments. Pigs were randomly allotted to 8 replications with 5 pigs per pen based on BW. Average daily gain increased (linear, P < 0.01; and quadratic P < 0.05, respectively) gain:feed. Increasing TID lysine from 0.9 to 1.3% also improved (linear, P < 0.01), while ADFI decreased (linear, P < 0.06) to 1.3% TID lysine. Increasing TID lysine from 0.9 to 1.3% also improved (linear, P < 0.01; and quadratic P < 0.05, respectively) gain:feed. Increasing TID TSAA from 0.56 to 0.81% increased (linear, P < 0.02) ADG and improved (linear, P < 0.01) gain:feed. Regression analysis of the response surface resulted in an estimated TID TSAA to lysine ratio ranging from 55 to 61% for ADG and 57 to 61% for gain:feed. Isobutyrate, valerate and isovalerate concentrations were decreased (P < 0.01) with supplementation. However, isobutyrate was not different between HI and LO. Ruminal pH was greatest (P < 0.01) for HI. Ruminal NH₃-N concentrations were decreased (P < 0.01) by supplementation. A TK x Time interaction existed (P < 0.01) for NH₃-N due to the concentration of NO remaining relatively constant throughout the 24 hr period. Total N flow at the duodenum was not affected by supplementation. This data indicates that supplementing steers consuming cool season grass hay with fibrous energy can increase ruminal and total tract fiber digestion without affecting forage intake.

**Key Words:** Fiber, Digestion, Ruminate

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**571 The optimal true ileal digestible lysine and threonine requirement for nursery pigs between 10 and 20 kg.** N. A. Lenehan¹, M. D. Tokach¹, S. S. Dritz¹, R. D. Goodband¹, J. L. Nelsen¹, J. L. Usry¹, J. M. DeRouchey¹, and N. Z. Frantz², ¹Kansas State University, Manhattan, ²Ajinomoto Heartland LLC, Chicago, IL.

A total of 360 pigs (Genetiporc; initially 10.7 kg and 34 d of age) were used in a 17-d growth assay. This trial was conducted as a combination of two separate trials in order to simultaneously examine both the true ileal digestible (TID) lysine and threonine requirements, and determine the appropriate threonine to lysine ratio. The first part of the trial consisted of five treatments with increasing TID lysine (0.9, 1.0, 1.1, 1.2, and 1.3%). The second part consisted of five treatments with increasing TID threonine (0.60, 0.66, 0.73, 0.79, and 0.85%). The highest level of both lysine and threonine (1.3 and 0.85%, respectively) served as a positive control and this diet was combined as one treatment to give a total of nine treatments. There were 8 replications with 5 pigs per pen. Both ADG and gain/feed (G/F) increased (quadratic, P < 0.02) to 1.2% TID lysine. For threonine, ADG (linear, P < 0.03) and G/F (quadratic, P < 0.04) increased to 0.79% TID threonine. Using 0.79% TID threonine and 1.2% TID lysine as the requirements yields a TID threonine to lysine ratio of 66% for both ADG and G/F. In summary, these results suggest a TID threonine to lysine ratio of approximately 66% for 10 to 20 kg pigs.

**TID Lysine, %**

<table>
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<tr>
<th>Item</th>
<th>0.9</th>
<th>1.0</th>
<th>1.1</th>
<th>1.2</th>
<th>1.3</th>
<th>SED</th>
<th>Linear</th>
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<td>ADG, g</td>
<td>532</td>
<td>541</td>
<td>587</td>
<td>599</td>
<td>582</td>
<td>19</td>
<td>&lt; 0.01</td>
<td>0.02</td>
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<tr>
<td>ADFI, g</td>
<td>918</td>
<td>870</td>
<td>917</td>
<td>923</td>
<td>896</td>
<td>35</td>
<td>0.81</td>
<td>1.00</td>
</tr>
<tr>
<td>Gain/feed</td>
<td>0.58</td>
<td>0.62</td>
<td>0.64</td>
<td>0.65</td>
<td>0.65</td>
<td>0.01</td>
<td>&lt; 0.01</td>
<td>&lt; 0.01</td>
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</table>

**TID Threonine, %**

<table>
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<th>Item</th>
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<th>0.66</th>
<th>0.73</th>
<th>0.79</th>
<th>0.85</th>
<th>SED</th>
<th>Linear</th>
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<td>582</td>
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<td>ADFI, g</td>
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<td>897</td>
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<td>896</td>
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<td>0.45</td>
</tr>
<tr>
<td>Gain/feed</td>
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<td>0.64</td>
<td>0.64</td>
<td>0.65</td>
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**Key Words:** Threonine, Lysine, Nursery Pigs

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**Total Sulfur Amino Acids, Lysine, Nursery Pigs**