filters (300 µm pore size) were used to also remove protozoa via filtrate pumps over 3 d; after further 7 d of adaptation, the fermenters were sampled for 3 d. Throughout, the fermenters were fed 40 g/d of a 30:70 concentrate:forage diet (1 meal) containing either no additive, 4% animal-vegetable fat, bromoethanesulfonate (BES, 250 µM; a methane inhibitor), or monensin (2.5 µM). Protozoal counts were used to calculate generation times (total pool size of cells in the fermenter /flow of cells in the effluent). The model included the fixed effects of period, treatment, and filter, and the random effect of fermenter. Means were compared using protected LSD. Flow of total N and digestibilities of NDF and OM were 18%, 16% and 9% higher, respectively, for the defaunated sub-period but were not different between treatments. Methanogenesis was unaffected by defaunation but tended (P=0.07) to be decreased by monensin. Protozoal counts were not different between treatments, but BES increased the generation time from 43.2 to 55.6 h. Ammonia concentration was 33% higher in the faunated fermenters but not affected by treatment. Defaunation did not affect total VFA production but decreased the acetate: propionate ratio; monensin increased isovalerate production in both sub-periods, but more in faunated. Monensin selects for Gram negative bacteria such as *Megasphaera*, *Fibrobacter*, and *Prevotella*, which can produce isovalerate and might increase deamination of AA from protozoal proteolysis. Because of challenges in defaunation in vivo, our modified system should advance our understanding of protozoal ecology.

Key Words: Methane, Protozoa, Monensin

131 Gastrointestinal metabolism and plasma concentrations of the methane-inhibitor, nitroethane, in fed steers. R. Anderson*[1], N. Ramlachan[1], H. Gutiérrez-Bañuelos[2], G. Carstens[2], W. Majak[3], R. McDiarmid[3], T. Callaway[1], R. Harvey[1], S. Horrocks[1], T. Edrington[1], and D. Nisbet[1], [1]*USDA/ARS, Food & Feed Safety Research Unit*, *College Station, TX*, [2]*Texas A&M University*, *College Station*, [3]*Agriculture & Agri-Food Canada, Kamloops Range Research Unit*, *Kamloops, BC, Canada*.

To investigate the metabolism and absorption of the methane-inhibitor, nitroethane (NE), we fed 18 steers (403±26 kg BW; mean±SD) a 50% concentrate diet and administered 0, 80 or 160 mg NE/kg BW per day (6 steers/treatment) for 14 d. Treatments were administered orally 2X daily. Ruminal fluid and feces were collected on d -1, 1, 2, 7 and 14 of treatment; blood samples were collected at 0 and 6 h and at 1, 2 and 7 d of treatment. Rates of NE degradation (dNE/dt) were determined by in vitro incubation. Concentrations of NE were determined colorimetrically. Mean (±SD) NE concentrations in plasma 6 h after start of NE treatments were 0.12±0.1 and 0.41±0.1 µmol/ml for steers administered 80 or 160 mg NE/kg BW per day, respectively, indicating rapid absorption of NE. Plasma NE concentrations peaked 1 d after initiation of the 80 or 160 mg NE/kg BW per day treatments (0.38±0.1 and 1.14±0.1 µmol/ml, respectively). Plasma NE concentrations declined thereafter to 0.25±0.1 and 0.78±0.3 and to 0.18±0.1 and 0.44±0.3 µmol/ml on days 2 and 7 for the 80 or 160 mg NE/kg BW per day treatment groups, respectively, indicating decreased absorption or more rapid excretion or metabolism of the compound. An analysis of variance revealed that ruminal dNE/dt from steers administered NE were >2.5-fold higher (P<0.05) than the mean (±SD) rate observed in steers administered no NE (0.05±0.1 µmol NE/ml ruminal fluid per h). This observation suggests an enrichment of NE-degrading bacteria in the rumen of both groups of NE-treated steers. Fecal dNE/dt (0.07±0.1 µmol NE/g feces per h) were unaffected (P>0.05) by treatment indicating that NE was not present at high enough concentrations in the lower gut to affect a similar enrichment of NE-degrading bacteria in these steers.

Key Words: Methane, Nitroethane, Rumen

132 Effects of feeding a polyclonal antibody preparation against Streptococcus bovis on rumen fermentation of heifers switched from a high forage to a high concentrate diet. M. Blanch*[1], S. Calsamiglia[1], N. DiLorenzo[2], and A. DiCostanzo[2], [1]*Universitat Autonoma de Barcelona*, *Bellaterra, Spain*, [2]*University of Minnesota*, *St. Paul*.

The effects of feeding a polyclonal antibody preparation against Streptococcus bovis (PAPSb) were studied in a completely randomized experiment using 12 crossbred heifers (452±20 kg BW) with two groups (6 animals each): control (CTR) and polyclonal antibody treatment (PAPSb, CAMAS Inc., MN). The acidosis induction protocol included 3 periods: 3 months of baseline (100% fescue ad libitum), 10 d adaptation (d 1-10 of the experiment, fed 100% forage + 10mL of PAPSb top-dressed in treatment group) and 12 d of challenge feeding (d 11-22 of the experiment). The challenge consisted in increasing the concentrate (16% CP) intake 2.5 kg DM per day until 12.5 kg (achived in 5 days) plus fescue ad libitum. The treatment group received 10 mL of PAPSb daily. Acidosis was declared when pH reached 5.5 or when concentrate intake was reduced more than 50% compared with the previous day. When an animal was considered acidotic it was taken out of the experiment. Samples of ruminal contents were collected at 0h and 6h post feeding to determine pH, and volatile fatty acid and ammonia-N concentrations. Data were analysed using PROC MIXED of SAS (version 8.2). Differences were declared at P<0.05. PAPSb had higher pH values at 0h post feeding in days 16 (6.70 vs 6.11), 18 (6.54 vs 5.95) and 19 (7.26 vs 6.59) compared with CTR. PAPSb had higher concentration of acetic acid at 6h post feeding (81.8 vs 90.3 mM for CTR and PAPSb, respectively) and higher total volatile fatty acid concentration (132.9 vs 147.1 mM for CTR and PAPSb, respectively). These results indicate that PAPSb may be effective in reducing acidosis when heifers are abruptly adapted from a high forage to a high concentrate diet.

Key Words: Streptococcus bovis, Antibody, Rumen fermentation

Graduate Student Paper Competition: ADSA Southern Branch

133 Waste milk supply and pasteurizer performance on three North Carolina dairy farms. M. C. Scott*[1], R. E. James[1], M. L. McGilliard[1], and B. A. Hopkins[2], [1]*Virginia Polytechnic Institute and State University*, *Blacksburg*, [2]*North Carolina State University*, *Raleigh*.

Feeding saleable milk or milk replacer to the pre-weaned calf results in high daily feed cost. All dairy farms generate waste milk (WM) that cannot be sold. Waste milk includes, but is not limited to, transition milk and milk from cows treated with antibiotics. Feeding WM to calves reduced feed cost, but raises bio-security concerns. Pasteurization effectively lessens health risk associated with feeding WM. The objective of this study was to determine amount and composition of WM generated by three dairy farms and to track effectiveness of on-farm high-temperature short-time (HTST) pasteurizers. Bacteriological

activity and components of the pasteurized WM were measured until it was fed to calves on two of the farms. Pasteurizer function was measured by alkaline phosphatase deactivation (AP) and aerobic plate count (APC). Farm 1, 2 and 3 milked 1100, 2500 and 800 cows, and all used commercial HTST pasteurizers. Farms were visited every 2 wk for 28 wk during the spring and summer of 2005. Waste milk generated per calf on farm 1, 2 and 3 was 2.8, 10.3, and 4.4 kg/d. Post pasteurization (PostPast) samples were AP positive 18%, 15%, and 0% on farm 1, 2, and 3. Mean APC pre-pasteurization (PrePast) and PostPast for all farms was $1.73X10^7$ cfu/ml and $4.5X10^5$ cfu/ml. When AP was positive, APC averaged 348,000 cfu/ml and $5.3X10^6$ cfu/ml for farm 1 and 2. When AP was negative, APC averaged 64,000 cfu/ml and 367,000 cfu/ml for farms 1 and 2. The APC of PostPast WM increased over time as calves were fed. The LSM, adjusted for farm and season, ranged from $2.4X10^6$ cfu/ml at initiation of feeding to more than $1X10^7$ cfu/ml at the end of feeding one hr later. Commercial HTST pasteurizers require proper operation in order to assure successful pasteurization. The supply of WM was inadequate to feed all calves on two farms. Improper handling of PostPast WM increased APC almost to PrePast levels, indicating poor sanitation of feeding equipment.

Key Words: Pasteurization, Calf, Waste milk

134 Breed differences in postpartum cyclicity of pasture-based dairy cows. C. M. Williams*, S. P. Washburn, A. N. Elias, and C. S. Whisnant, *North Carolina State University*, *Raleigh*.

The purpose of this study was to examine potential breed differences in postpartum cyclicity of fall calving pasture-based dairy cows. Milk samples from sixty-five post-partum dairy cows of three breeds (Holstein, n=16, Jersey, n=23, and various Holstein and Jersey crosses, n=26) were collected twice weekly. Collections were done during the PM milking at the Center for Environmental Farming Systems (CEFS) Dairy Unit, Goldsboro, NC and measured approximately 100mL. Milk production averages for each breed were obtained and are as follows: 29.6±2.3 kg/d for Holsteins, 21.3±1.7 kg/d for Jerseys, and 21.7±1.5 kg/d for crossbreds. Milk was centrifuged to obtain skim milk for a radioimmunoassay for progesterone (P4) with a sensitivity of 0.02 ng/mL. Return to cyclicity was defined as the first day progesterone levels were ≥ 1 ng/mL for two consecutive samples or ≥ 2 ng/mL for one sample. For cyclic cows, anestrous length was calculated from calving date until the first day P4 was ≥ 1 ng/mL. By thirty days postpartum, more crossbred cows had initiated estrous cycles than purebred Jersey or Holstein cows (70% versus 52% and 47% respectively, $P<0.05$). However, by sixty days postpartum, 100% of the Jersey and crossbred cows had initiated estrous cycles whereas only 12 of 16 (75%) of Holsteins were cyclic ($P<0.001$). Although intervals to calving until first P4 rise among cyclic cows did not differ (34.3±3.0 days for Holsteins, 31.1±2.2 days for Jerseys, and 32.1±2.0 days for crossbreds), it is expected that Holsteins will have significantly longer intervals once all cows are cyclic. Breed differences in postpartum cyclicity were evident in that fewer Holsteins initiated early postpartum estrous cycles compared to either Jerseys or crossbred cows.

Key Words: Dairy, Crossbreeding, Progesterone

135 Effect of feed additives on aflatoxin in milk of dairy cows fed aflatoxin-contaminated diets. J. Stroud*[1], E. English[1], S. Davidson[1], B. Hopkins[1], G. Latimer[2], W. Hagler[1], C. Brownie[1], and L. Whitlow[1], [1]*North Carolina State University*, *Raleigh*, [2]*Texas A&M University*, *College Station*.

Sixty lactating Holstein cows were used in a replicated block experiment to determine the efficacy of eight feed additives to reduce the transfer of aflatoxin from feed to milk. Six cows were allocated to each treatment group and 12 to a control group. All cows were fed the same aflatoxin-contaminated total mixed ration (TMR) (≈ 170 ppb, provided by naturally contaminated corn grain) and then either no additive (control) or one of eight additives at 0.5% of the TMR dry matter. Milk samples were collected twice daily on day five after initiating aflatoxin feeding and on days five and six after including additives. Milk aflatoxin concentration [µg/L] was measured by HPLC. Changes in milk aflatoxin concentration, milk aflatoxin excretion (milk aflatoxin concentration × milk yield); and aflatoxin transfer from feed to milk (aflatoxin excretion as a percentage of aflatoxin intake) were evaluated. All changes were expressed as percentages and calculated relative to the control group which defined zero change. Changes were considered significantly different from zero when $P<0.05$. Additives are described by their analyzed composition of organic carbon and ammonium acetate extractable amounts of calcium, magnesium, sodium and potassium. The organic carbon percentage was 48,14,<1,<1,19,<1,<1,<1 for the additives 1 through 8, respectively. The ammonium acetate extractable Ca, Mg, Na and K contents ($cmol_c$ /kg) were 7,18,19,30; 28,12,18,11; 59,12,2,9; 92,13,<1,2; 74,15,27,9; 10,11,<1,2; 52,15,44,<1 and 43,15,12,<1 for the additives one to eight, respectively. Inclusion of the additives resulted in percentage changes in aflatoxin transfer from feed to milk of 3,-8,-7,-42,-34,-13,-48 and -44 for the additives one to eight, respectively. Four of the eight additives added at 0.5% of DMI significantly reduced milk aflatoxin concentration, excretion and transfer from feed to milk of dairy cows fed approximately 170 ppb aflatoxin.

Key Words: Adsorption, Aflatoxin, Dairy

136 Using dietary heat increment to alter energy use in dairy cows during hot weather. L. M. Pacetti*, J. W. West, J. K. Bernard, and C. D. Wildman, *The University of Georgia*, *Tifton*.

Thirty-two lactating Holstein cows averaging 169 DIM (±35 d) were used to determine changes in energy use due to ration heat increment (HI). The study was conducted from June 15 through August 24, 2005. Mean maximum and minimum temperature, relative humidity, and temperature-humidity index during the treatment period were 31.2 and 22.7°C; 99 and 61%; and 82.2 and 72.8, respectively. Dietary treatments were high HI offered ad libitum (HA), low HI offered ad libitum (LA), and low HI offered at restricted caloric intake (LR). The LR cows were paired individually with HA cows to achieve similar NE_L intake (Mcal/100 kg BW). High heat increment diets were formulated using greater concentrations of forage and fibrous byproducts. Low heat increment treatments were formulated using lower forage concentration, no fibrous byproducts, and increased quantities of grain and fat. For DMI, HA (24.6 kg) was greater than both LA (22.8 kg) and LR (20.5 kg) [$P<0.0001$]. Increased DMI/100 kg BW was also noted for HA (3.7 kg) compared with LA (3.6 kg) and LR (3.3 kg) [$P<0.05$]. No differences were observed among treatments for NE_L intake ($P<0.07$) with mean values of 6.4, 6.5, and 6.0 Mcal/100 kg BW for HA, LA, and LR, respectively. Milk yield (34.5, 34.6, and 33.0 kg/d) and energy-corrected milk yield (34.2, 31.6, and 31.5

kg/d) for HA, LA, and LR, respectively, were similar across dietary treatments. Milk yield ($P<0.002$) and energy-corrected milk yield ($P<0.03$) [kg/kg DMI] were greater for LR (1.5 and 1.6) compared with HA (1.3 and 1.4). Milk net energy secretion (Mcal/100 kg BW) was similar across treatments. Yield and concentration of fat, protein, and total solids were similar across dietary treatments. A trend for NE balance (NE_Lbalance = NE_Lintake - NE_Lmilk ± NE_Ltissue) was observed; NE balance was lower for LR (0.01 Mcal/d) compared with HA (3.9 Mcal/d) and LA (5.7 Mcal/d). There was a minor trend for improved efficiency of energy use for the low heat increment diet. Additional research is needed to elucidate differences in energy efficiency in relation to HI during heat stress.

Key Words: Dairy nutrition, Heat stress, Heat increment

ADSA-SAD – Undergraduate Competition: Dairy Production

137 The use of copper sulfate to improve hoof health in dairy cattle. M. Konzelman*, *Louisiana State University*, *Baton Rouge*.

One of the most important parts of a dairy cow is her feet. If a herd is experiencing hoof health problems, then the producer will have more than sore feet when the milk check arrives. Diseases such as foot rot and hairy heel warts should not be taken lightly as they can have a major impact on a herd's overall performance. Decreased production occurs as a result of the cows' unwillingness to walk to the feed, and consequently they do not obtain the proper nutrition to maximize milk production. Poor hoof health may also result in decreased reproductive efficiency because sore feet lead to reduced signs of estrus. One way to improve hoof health is by using copper sulfate. Copper sulfate is a compound formed when sulfuric acid reacts with copper oxide. It is used on dairy farms in foot baths to form a solution that works wonders on diseases such as foot rot and hairy heel warts. Although copper sulfate is effective in improving hoof health, producers must be careful with the amount used as it can cause copper toxicity in soil. The waste from the foot bath is generally washed out with the manure into lagoons or some form of waste management system. When water from the lagoons is pumped out, the waste copper pumped with it onto the field. Over time this can cause a copper buildup that could be toxic to some crops. If a digester type manure system is used, the copper could actually kill the bacteria that digest the manure. When used properly, copper sulfate is a relatively inexpensive management tool for improving hoof health. In the long run, this expense will bring savings to the producer through increased milk production.

Key Words: Copper sulfate, Hoof health

138 The agricultural workforce: Changing times and issues. K. Connelly*, *Pennsylvania State University*, *University Park*.

One of the most challenging obstacles facing animal agriculture is finding skilled and qualified labor. The sustainability and productivity of the industry is closely related to the strengths and abilities of its workers. The U.S. Census of Agriculture reported that more than 550,000 farms hired laborers in 2002, with the workforce accounting for one in every eight dollars spent on farm production. The dependence upon international workers has increased significantly in the U.S. in recent years. This influx of new workers has significantly altered the demographics of rural communities. For example, New York's farm worker population shifted from mainly African-American to Hispanic over an eleven year period. Farm employers must now give greater consideration to the health and safety of workers, as well as to employer/employee communication. According to The Bureau of Labor Statistics, Hispanic workers have a 25% higher fatality rate than non-Hispanic workers. Cornell University's Agriculture Health & Safety Worker Training Program is an example of recent initiatives devoted to the issue of the evolving animal agriculture workforce. Much can be learned from the western farms that first began hiring Hispanic workers from Mexico. The University of California, Berkeley, created the Agricultural Personnel Management Program, which is used as a resource by producers dealing with common problems such as a migrant workforce. Dairy producers throughout the rest of the country are beginning to realize the significance of dealing effectively with international labor force. The number of programs and publications for dairy employees available in Spanish and other languages has increased dramatically. With constant changes in agricultural industry demographics, attention devoted to workforce development will continue to influence U.S. productivity.

Key Words: Laborers, Workforce development, Safety

139 Dairy production in south China: Challenges and opportunities. L. Schultz*[1], and B. Moss[3], [1]*Iowa State University*, *Ames*, [2]*Agricultural Trade Office, U.S. Consulate General*, *Guangzhou, China*, [3]*Auburn University*, *Auburn, AL*.

The Chinese dairy industry is developing rapidly as domestic demand skyrockets. Per-capita consumption of dairy products has more than doubled over the last five years, and producers in South China are struggling to keep up. Average annual production in the six-province region hovers at 4 MT per cow, much lower than in the developed world. Although a large percentage of cattle in the region are imported from New Zealand, Australia and the U.S., management challenges limit the genetic potential of these animals. Specific problems in the region include a lack of high-quality forages, poor cow comfort and inadequate heifer raising programs. Milk quality also remains a key issue as several food safety scares have shaken consumer confidence in the industry. Education plays a key role in addressing these concerns and ensuring the future success of China's dairy sector. Improving domestic production also has many global implications, creating an opportunity for more international cooperation and trade.

Key Words: China, Education, Forage quality

140 Methane digestion- same manure- more energy and nutrients- less odor. A. Offenheiser*, *University of Kentucky*, *Lexington*.

A new light is shining on the dairy industry, or shall we say, because of it. With the opportunity to produce most, if not all of the electricity needed to run the farm, many dairies are investing in methane digesters. The use of a digester allows farmers to turn manure into a versatile source of energy. In absence of oxygen, bacteria transform volatile solids into biogas which is 50-70% methane. Methane gas can be used, like any other flammable gas, to generate electricity, heat, or even as a fuel on which to run motors. Not only have dairies been able to sufficiently power their operations and save considerable amounts of