2 (100 XU of xylanase activity/kg diet). Ileal and fecal samples were collected at Wk 6-7 and Wk 12-13 of gestation and Wk 2-3 of lactation. Females were randomly allotted to a diet in each wk of the collection period. After 5 d adaptation to the diet, ileal samples were collected for a period of 12 h on each of 2 d. Diets were then changed and another collection was made (providing a total of 5-6 observations/diet). Fecal sample collection took place between d 4-7. Apparent digestibility of DM, N, GE, ADF, and NDF was determined using Cr_2O_3. There were no effects ($P > 0.10$) of the enzyme products on nutrient digestibility during gestation. Ileal digestibilities (%) of DM, N, GE, ADF, NDF during lactation were 77.3, 79.3, 81.7; 81.2, 82.5, 84.3; 79.5, 81.5, 83.8; 37.3, 36.5, 42.3; 75.4, 77.9, 78.6 for Trt 1, 2, and 3, respectively. Total tract digestibilities (%) of DM, N, GE, ADF, and NDF during lactation were 89.8, 90.7, 90.8; 89.0, 90.0, 90.6; 90.7, 91.4, 92.0; 75.0, 66.0, 77.8; 88.2, 89.8, 89.4. Ileal DM ($P < 0.02$), GE ($P < 0.02$), and NDF ($P < 0.08$) as well as total tract DM ($P < 0.11$) and GE ($P < 0.04$) digestibilities were improved by Enz 2, and total tract NDF ($P < 0.11$) was positively affected by Enz 1. Gestational enzyme supplementation was not beneficial; however, the enzyme product containing xylanase activity appears to have potential to increase digestibility of nutrients during lactation.

Key Words: Sows, Digestibility, Enzymes

71 Impact of increased valine:lysine ratio during lactation on sow and piglet performance. A. M. Gaines*[1], M. E. Johnston[2], G. L. Allee[2], R. D. Boyd[2], J. L. Usry[3], and K. J. Touchette[4], [1]*University of Missouri-Columbia,* [2]*The Hanor Company, Inc.,* [3]*Ajinomoto Heartland, Inc., Chicago,* [4]*Merrick's Inc., Union Center, WI.*

This study was conducted to determine the effects of increased valine levels during lactation on sow and piglet performance. A total of 279 PIC C22, C23, and C24 sows (parities 1-5) were allocated by parity to one of four dietary treatments. Diets 1 and 3 were formulated using corn and a fixed inclusion of soybean meal (16.73%). The dietary valine content was increased by adding L-valine with additional synthetic amino acids supplied as necessary to meet minimum amino acid ratios. The total valine:lysine ratio in diets 1 and 3 were 0.73 and 1.25, respectively. Diets 2 and 4 were typical corn- soybean meal diets containing 0.05% L-lysine HCl, with a fixed inclusion of soybean meal (22.68%). The total valine:lysine ratios in diets 2 and 4 were 0.86 and 1.25, respectively, with L-valine used to increase valine content. All diets contained 0.90% total lysine and fed in meal form. Sows were fed ad libitum from d 112 of gestation through a 19-d lactation period and feed intake recorded. Sow body weight was recorded at d 112, after farrowing, and at weaning. Litter size was standardized by 24 h post-farrowing (10.6 0.2 pigs) and pigs were individually weighed at birth and weaning. There was no difference ($P = 0.30$) in sow feed intake across all dietary treatments. Sows consumed an average of 6.3 kg/d during the 19-d lactation period. Sow weight loss during lactation ranged from 9.4-12.5 kg and was not significantly different ($P = 0.61$) due to valine:lysine ratio. No dietary treatment effects were observed for body weight at weaning ($P = 0.48$) or piglet gain ($P = 0.38$). Furthermore, the number of pigs weaned was not different ($P = 0.37$) due to valine:lysine ratio. Based on the results of this study, there is no advantage in sow or piglet performance from increasing the valine:lysine ratio.

Key Words: Valine, Lactation, Sows

72 Effect of protected n-3 polyunsaturated fatty acids (Fertilium^{TM}) on litter size in sows. S. K. Webel*, E. R. Otto, D. M. Webel, R. L. Moser, J. D. Spencer, and D. E. Orr, *United Feeds, Inc.*

The effect of diet supplementation with a protected n-3 polyunsaturated fatty acid source (Fertilium^{TM}, United Feeds, Inc. Sheridan, IN) on subsequent reproductive performance in sows (York x Landrace) was evaluated. At a commercial swine farm in Indiana, primiparous and multiparous sows were blocked by parity and randomly assigned to one of two dietary treatment groups (control, n=173 or Fertilium^{TM}, n=165) when entering farrowing rooms, 5 d ± 2 d prior to farrowing. Corn-soybean meal based diets served as control treatments (control lactation diet, 1.22% lysine, 3.22 Mcal/kg ME; control rebreeding diet, 0.80% lysine, 3.11 Mcal/kg ME). Fertilium^{TM} group sows were fed control diets supplemented with 85 g topdress of Fertilium^{TM} once daily. Dietary treatments were administered to sows entering farrowing room, during lactation, and up to 7 d post weaning during re-breeding period (total 35 d). Sows were weaned after 21 d ± 3 d lactation and bred at the first estrus. All sows received a common diet (0.80% lysine, 3.11 Mcal/kg ME) throughout gestation until subsequent farrowing. Subsequent litter size (total born and live born) of farrowed sows was measured and results are presented in Table 1. The number of total born and live born pigs was greater ($P<0.05$) at the subsequent farrowing for sows topdressed Fertilium^{TM} compared to control sows. The wean to estrus interval and farrowing rate were not different ($P>0.10$) between treatments. These results show that dietary supplementation of protected n-3 polyunsaturated fatty acids increased litter size when fed to sows for 35 d prior to breeding.

Treatment	Sows Allotted	Sows Farrowed	Days Fed	Subsequent Total Born	Subsequent Live Born
Control	173	117	35	11.0^a	10.3^a
Fertilium^{TM}	165	121	35	11.6^b	10.8^b

^{a,b} Means within column lacking common superscripts differ significantly ($P<0.05$).

Key Words: Sow, Litter size, n-3 Polyunsaturated fatty acids

Production, Management, & the Environment

73 Evaluation of two evaporative cooling systems for dairy cattle under semi-arid conditions. R. J. Collier*, E. L. Annen, D. E. Armstrong, and A. L. Wolfgram, *University of Arizona,Tucson, AZ.*

Cows(N=80) balanced for parity,stage of lactation and milk yield were randomly assigned to Korral Kool (KK) or oscillating fan and spray (OS) cooling systems from 6/26-9/26,2002. Each pen included a shade structure(7.3 m by 18.3 m)oriented north/south. The KK pen had three overhead coolers, with computer driven variable speed fans and variable pressure water injection into the airstream. The OS pen had three (0.9M)computer driven variable speed fans with variable airstream water injection placed below the western edge of the roof. The arc of the OS fan was 270 °. Both systems varied fan speed and water injection according to THI. Water and electrical use was metered on each system. Water use (L/d)was higher in OS compared to KK (7330 vs 4989, P≤.03). Electrical use (KW/d) was lower for OS compared to KK (76.4 vs 93, P≤.03) Temperature and humidity recorders established THI outside and under each shade. Mean THI outside the shades was 80. Mean THI was higher under OS compared to KK (78 vs 77, P ≤.001). Thermal status of cows was established via infrared gun and visual observation of respiration rate (rr). Average cow surface temperature (°C) was higher for OS compared to KK (34.3 vs 26.6, P≤.001). Likewise rr/min was higher in OS cows compared to KK cows(65.5 vs 56.7, P≤.001) Milk yield (kg/d)N=79, did not differ in OS compared to KK, (36.2 vs 36.7). We conclude that KK improved cow comfort over OS but this did not result in a milk yield difference.

Key Words: Heat stress, Cooling systems, Dairy cattle

74 Effects of sprinkler, shade, and fan cooling of preparturient Holstein cows on postparturient milk performance during summer heat stress. J. H. Urdaz*, M. W. Overton, D. Moore, and J. E. Santos, *Veterinary Medicine Teaching and Research Center University of California, Davis Tulare, CA/USA.*

The purpose of this study was to examine the effects of shades, fans, and sprinklers on the last three weeks of gestation of Holstein cows during summer heat stress. Outcome variables included postparturient milk production, rectal temperatures, body condition score(BCS), and incidence of postparturient disorders. Four hundred and thirty prepartum multiparous cows 250-257 days pregnant were randomly allocated to two identically structured pens. Treatments consisted of sprinklers over the feedbunk (CONTROL, n=209); and sprinklers, fans, and shades over the feedbunk (COOLED, n=221). To be eligible for analysis, cows

were required to spend a minimum of 14 days in their assigned pen before parturition. After calving, both groups were housed in the same freestall facilities. Computerized data recorders in each pen recorded environmental temperature every half hour. Rectal temperatures were measured twice weekly for three weeks before parturition. Body condition scores were taken at study enrollment, parturition, 60 days in milk (DIM), and 150 DIM. Following calving, the presence of parturient paresis, retained placenta, and metritis were recorded for the first 10 DIM. Milk production was measured using twice-monthly DHIA tests for the first 150 DIM. Descriptive statistics were used for environmental temperatures. Data on rectal temperature, BCS, and milk production were analyzed by the MIXED procedure of the SAS (2001) program. Chi-square analysis was used for postparturient disease outcomes. Average daily environmental temperature in the control group was 79.6 F 19.1 vs. 77.2 F 16.5 in the cooled group during the length of the trial. There was no significant difference in rectal temperatures (P= 0.62), BCS (P= 0.57), incidence of parturient paresis (P= 0.99), or retained placenta (P=0.69). A treatment by test date interaction was detected for milk production (P= 0.03) and cows in the cooled group produced more milk than controls in the first 15 days in lactation (79.6 vs. 75.0 lbs/d; P<0.05). Cooling pre-parturient cows with shade, fans, and sprinklers may increase milk production immediately after parturition. Further analyses are needed to assess the economic feasibility of adding cooling systems to preparturient cows.

Key Words: Cooling, Preparturient Holstein cows, Heat stress

75 A large-scale survey evaluating the effect of cooling Holstein cows on productive and reproductive performances under sub-tropical conditions. I. Flamenbaum*[1] and E. Ezra[2], [1]*Ministry of Agriculture, Extension Service,* [2]*Israel Cattle Breeders Association.*

The effect of cooling dairy cows was studied during four years (1998 #2001). The survey included 14 farms, located in the costal part of Israel and classified into three different groups according to the intensity of cooling in summer. Cows of group 1 (six farms, intensive cooling), were cooled in the holding and feeding area for a total of 10 cooling periods and 7.5 cumulative hours per day. Each cooling period combined cycles of sprinkling (0.5 min.) and forced ventilation (4.5 min.). Cows of group 2 (three farms, moderate cooling), were cooled in the holding area only, and were provided a total of six cooling periods and 4.5 cumulative hours per day. Cows of group 3 (five farms, no cooling) were not cooled at all. Milk production (kg/d) and conception rates (%), were calculated for summer (July-September) and winter (December-February). The analysis included 125,000 milk recordings (> five recordings for each cow per lactation) and 17,000 inseminations. Average four years daily low and high temperatures (C) were 8.4 and 19.3, and 22.0 and 31.8, for winter and summer, respectively. The effect of the interaction between season and cooling system was significant (P<0.001). The ratios between summer and winter production were 98.5%, 96.2% and 93.4%, in intensive, moderate, and no cooling regimes, for primiparous cows and 98.5%, 96.1% and 90.7% for multiparous cows, respectively. Conception-rates were 55.8%, 53.5% and 53.9%, and 40.4%, 34.0% and 14.6%, for primiparous cows under the intensive, moderate, and no cooling regimes, inseminated in winter and summer, respectively (P<0.01). Conception-rates were 46.6%, 45.8% and 43.5%, and 33.8%, 34.5% and 16.7% for multiparous cows in the same groups inseminated in winter and summer, respectively (P<0.01). The results indicate that intensive cooling significantly reduces the seasonal variations in productive and reproductive performances of dairy cows under sub-tropical conditions.

Key Words: Cooling cows, Milk production, Conception rate

76 Effect of low-pressure soaking frequency and high-pressure misting on respiration rate, body surface temperature and body temperature of heat stressed dairy cattle. M. J. Brouk*, J. P. Harner, J. F. Smith, A. K. Hammond, W. F. Miller, and A. F. Park, *Kansas State University.*

Ten lactating Holstein cows (5 primiparous and 5 multiparous) were arranged in a replicated 5x5 Latin Square design to evaluate the effect of low-pressure soaking frequency and high-pressure misting on respiration rate, body surface temperature, and body temperature of heat stressed cattle. Animals were housed in freestall barns and milked 2x. During testing, cattle were moved to a tiestall barn for a period of 2 hours starting at 13:00 on five days of intense heat stress. During the testing periods, respiration rates were determined every five minutes by visual observation. Body surface temperature of three sites (shoulder, thurl and rear udder) were measured with an infrared thermometer and recorded at 5-minute intervals. Body temperature was recorded with a data logger and vaginal probe every minute and averaged over 5 minute intervals. Treatments were control (C) a lower-pressure soaking cycle every 5 (5+F), 10 (10+F) or 15 (15+F) minutes and continuous high-pressure misting (HP+F). Similar amounts of water were used in each soaking treatment. Soaking and misting treatments included supplemental airflow. The skin of cattle receiving the soaking and misting treatments became soaked over the course of the treatment period. Average respiration rates of cattle studied were 111.7, 98.7, 95.3, 84.4, and 87.6 breaths/minute for C, 15+F, 10+F, 5+F and HP+F, respectively. Treatments differed (P<0.01) from each other and the 5+F treatment showed the greatest reduction in respiration rate. Cooling treatments reduced (P<0.01) body surface temperatures. Average shoulder surface temperatures were 37.7, 34.6, 33.9, 32.2 and 31.4 °C. Average rear udder surface temperature followed a similar pattern (37.9, 37.8, 37.6, 37.3 and 36.4 °C, respectively) differed (P<0.01) among treatments. Cooling heat stressed dairy cattle with either low-pressure soaking or misting that soaked the dorsal body surface was effective in reducing respiration rates and body surface temperatures. These data show that more frequent soaking and high-pressure misting that soaks the body surface increases heat abatement of dairy cattle.

Key Words: Heat abatement, Environmental modification, Facilities

77 Hair coat color may influence longevity of Holstein cattle in the tropics. C. N. Lee*[1], K. S. Baek[1,2], and A. Parkhurst[3], [1]*University of Hawaii-Manoa,* [2]*National Livestock Research Institute, Suwon, S.Korea,* [3]*University of Nebraska.*

Previous studies from FL and AZ suggested that Holstein cows with white hair coat produced more milk in hot climates. However, over a decade of observations of dairy herds in Hawaii and Asia suggest that majority of the animals in commercial herds are of black hair coat. Hence, a simple study to determine the accuracy of the observation was conducted in 2 large commercial herds in Hawaii. Cows were classified into 3 groups: a) black (B,>90%); b) black/white (BW,50:50)and c) white (W,>90%). Cows with other hair color distribution were excluded from the study. In Farm A, 215/960 lactating cows with 4-7 or more lactations were identified and in Farm B, 690/1,350 lactating cows with 2-5 or more lactations were identified for the study. The W cows in both herds had higher milk production (kg), but it was not statistically different; Farm A:B-11,511, BW-11,098, W-11,806; Farm B:B-9,593, BW-9,899, W-9,907 (SE 230). Regression analyses of the data based on % distribution for each hair coat within a lactation showed that the population of W cows decreased with increasing lactations for both farms (p<0.05). The W cows distribution decreased from 17.5% to 6.3% in farm A and from 15.7% to 7.4% in farm B as the number of lactations increased. The B cow population increased from 51% to 78% for farm A for 4th to 6th lactation while in farm B, this population increased from 45% to 55.4% for 2nd to 5th lactation. Further analyses by Wilcoxon test for homogeneity of survival curves confirmed this; Farm A (p<0.05) and Farm B (p<0.06). Minimum changes in the distribution of BW population were observed. Analyses of B vs W hair coat in cows (ug/cm^2) yielded 8.2 vs 18.4 respectively (n=22). The data suggested that W cows had greater risk of survival in the tropics. Factors contributing to this phenomenon are currently being investigated.

Key Words: Hair coat, Survival, Milk production

78 The impact of cooling ponds in north central Texas on milk production and culling. M. Tomaszewski*[1], M. de Haan[2], J. Thompson[1], and E. Jordan[1], [1]*Texas A&M University,* [2]*Wageningen University.*

Heat stress is a major impediment to efficient production of milk in the Southern part of the US. One method of cooling cows is the utilization of cooling ponds during periods of high temperatures. The objective of this study was to determine if differences existed for production and culling data between farms with and without cooling ponds. Data from 55 herds located in north central Texas were selected. Monthly production and culling data from 1999 through 2002 were obtained from the DHI database. Twenty-two herds had installed cooling ponds, while 33 herds had not. Data were analyzed using the PROC MIXED procedure of SAS with cooling pond, season, and their interactions analyzed as

fixed effects and herd as a random effect. Seasons were grouped as August, the two months prior to August, the two months after August, and all other months. Least square means for differences between herds with and without cooling ponds in August showed an increase ($P \leq 0.001$) of 2.62 kg of milk/milking cow/d for herds with cooling ponds. When herds were compared within their pond status category for the two months pre- and post- August, there were no significant differences between the least square means. However, herds with cooling ponds increased production by 1.52 kg of milk/milking cow/d ($P \leq 0.05$) in the pre-August season and 1.47 kg of milk/milking cow/d ($P \leq 0.05$) in the post-August season when compared to herds without cooling ponds. During months in which cooling ponds were not used, there was no significant difference. When percent of cows that left the herds was evaluated to determine if differences in culling existed, no significant difference was found. In conclusion, cooling ponds had a significant impact on maintaining milk produced/cow/d during periods of heat stress and there was no difference in culling between farms with and without cooling ponds.

Key Words: Cooling pond, Heat stress, Culling

79 Evaluation of drought management strategies for cow-calf enterprises. R. E. Kruse*[1], M. W. Tess[1], R. K. Heitschmidt[2], J. A. Paterson[1], and B. F. Sowell[1], [1]*Department of Animal Science, Montana State University, Bozeman, MT 59717,* [2]*USDA-ARS, Fort Keogh Livestock and Range Research Laboratory, Miles City, MT 59301.*

Abstract: The objective was to evaluate alternative drought management strategies for their effects on profitability based on early detection of drought. A bio-economic model was parameterized to represent a range-based cow-calf production system in the Northern Great Plains. The base management system was characterized by inputs required to maintain herd size of 511 cows during an average climatic year with a fixed forage base of 4,329 AUM of range forage, plus 571 t grass and 189 t alfalfa hay. Treatments were factorially arranged where management (early vs normal) and intensity of drought (moderate, 20% reduction in available forage vs severe, 40% reduction in available forage) were evaluated for effects on system performance. The early management (EM) scenario included detecting drought by July 15th and decreasing the average age at weaning to 90d. The normal management (NM) scenario included no "early" management changes to emerging drought, but nutritional management was modified as needed to maintain in animal performance. A second bio-economic computer model was used to simulate drylot performance for early-weaned calves. Outputs from the two models were combined and treatments were evaluated based on feed costs, average weaning weight, ranch gross margin (gross margin # variable costs, RGM), and cumulative gross margin (ranch gross margin + revenue from drylot calves, CGM). During average climatic conditions CGM under the base management system was $137,730. During drought CGM was reduced compared to the base system: EM (17.6 and 48.8%) and NM (33.6 and 72.3%) for moderate and severe drought, respectively. For both levels of drought, EM had lower purchased feed costs and higher CGM than NM. Directly feeding EM calves proved more efficient than feeding NM cows to produce milk to maintain calf performance. Early weaning should effectively reduce the negative effects of drought on gross margin.

Key Words: Beef cattle, Drought management, Early weaning

80 Genetic analysis of the growth performance of Bhagnari and Droughtmaster x Bhagnari crossbred cows in Pakistan. A. U. Hyder*[1], A. Waheed[2], and M. S. Khan[3], [1]*Department of Animal Breeding and Genetics, University of Agriculture, Faisalabad, Pakistan,* [2]*Department of Animal Breeding and Genetics, University of Agriculture, Faisalabad, Pakistan,* [3]*Department of Animal Breeding and Genetics, University of Agriculture, Faisalabad, Pakistan.*

Pedigree and performance records of 296 Bhagnari and Droughtmaster x Bhagnari crossbred cows maintained at Beef Production Research Centre, Sibi (Balochistan) accumulated over a period of 30 years from 1969 to 1999, were utilized for the present study. The least squares means for birth weight, weaning weight and pre-weaning average daily gain were 23.49±3.76, 107.46±19.00 and 0.39±0.097 kg having coefficients of variation of 12.89, 13.75 and 13.75 percent. Year of birth significantly influenced birth weight, weaning weight and pre-weaning average daily gain, season of birth appeared to be a non-significant source of variation for all of the performance traits studied. Genetic group of the cows had a significant effect on birth weight, While other traits including weaning weight, pre-weaning average daily gain, were non-significantly affected by the genetic group of the cow. Genetic group of the dam had a non-significant influence on body weights at birth and weaning ($P>0.05$). The heritability estimates of birth weight, weaning weight, and pre-weaning average daily gain were found to be 0.09±0.02, 0.09±0.01, and 0.01±0.01, respectively. The estimates of phenotypic and genetic correlation between birth weight and weaning weight were -0.23 and -0.74, respectively. The estimated breeding values ranged from #171.44 to 242.48 kg for birth weight and from #171.44 to 22.48 kg for weaning weight. Estimated breeding values obtained were used to compute the genetic trends for various performance traits. The genetic trends for birth weight was negative and for weaning weight it was, however, slightly positive. All phenotypic trends were negative with the exception of the one for weaning weight, which was slightly positive.

Key Words: Growth, Heritability, Genetic trend

81 The effect of protein intake on milk protein efficiency in heat-exposed cows. A. Arieli*[1] and I. Bruckental[2], [1]*Hebrew University of Jerusalem, Rehovot, Israel,* [2]*Agricultural Research Organization, The Volcani Center, Bet Dagan, Israel.*

A trial was conducted using 42 mid-lactating (134 DIM) cows to evaluate the effect of dietary CP concentration on the production, composition and efficiency of milk production under hot ambient conditions. The trial was conducted from May until August 2002, in Bet Dagan, Israel. The mean, and maximal ambient temperature, relative humidity and thermal humidity index prevailing throughout the trial were: 27 and 32 oC, 70 and 88%, and 76 and 81, respectively. Cows had 3 showers daily; each lasting for 20 min. Cows were individually fed, and were randomly blocked into 2 dietary treatments. Group LP and HP were respectively fed with diets containing 15.1 or 16.7% CP. Other dietary constituent were: 36% RUP (% of CP), 32% NDF (54% of which from forage), 1.72 Mcal/kg NEL. Feed intake, milk yield, and body weight were measured daily. Milk composition was measured every two weeks. Body condition was weekly scored. During the 4th, and 8th wks of trial, blood was sampled before the morning meal. On these weeks six fecal samples were obtained in two succeeding days for digestibility evaluation by the indigestible NDF method. Digestibility of CP was lower in LP (64%) than in HP (66%) diet, while the DM digestibility was higher in the LP (65%) than in the HP (63%) diet. Intake of DM (23 kg/d), milk production (35 kg/d), milk protein (3.1%), fat (3.3%), and lactose (4.7%) were similar between treatments. The efficiency of milk protein production was higher in LP (0.30) than in HP (0.28) diet. Plasma concentrations of glucose (58 mg/dl), NEFA (0.13 meq/l), BHBA (9.7 mg/dl), total protein (8.2 g/l), and albumin (3.8 g/l) were not affected by dietary CP level. Milk urea was lower in LP (14.9 mg/dl) than in HP (16.3 mg/dl). Body weight gain and BCS accretion tended to be higher by 135 g/d, and by 0.1, respectively, in the LP as compared with the HP diet. It was concluded that a dietary CP concentration of 15% might be adequate to maintain production in heat-exposed dairy cows producing 35 kg of milk.

Key Words: Dietary CP, Heat stress, Milk protein efficiency

677 Milking procedures and udder health management on U.S. dairy operations: Results from NAHMS dairy 2002 study. J. E. Lombard*[1], B. J. McCluskey[2], and L. P. Garber[2], [1]*Integrated Livestock Management, Colorado State University, Fort Collins,* [2]*National Animal Health Monitoring System:CEAH:USDA, Fort Collins, CO.*

The National Animal Health Monitoring System's Dairy 2002 surveyed dairy operations in 21 states representing 82.8% of U.S. dairy operations and 85.5% of U.S. dairy cows. One component of the study investigated procedures associated with milking and udder health management practices aimed at decreasing mastitis incidence. The objective of this report is to describe current milking procedures and other management practices associated with udder health on U.S. dairy operations. Predip teat preparation methods were used on 59.1% (S.E.2.1) of all operations. Predips were used most frequently on operations with 100-499 cows. The most commonly used predips contained iodophores (70.3% (S.E.2.4) of operations using a predip) and chlorhexidine (10.4% (S.E.1.8) of operations using a predip). The most commonly reported teat wash method

for operations not using a predip were single-use cloth/paper towel. Operations that used a teat wash method most frequently dried teats using a single-use cloth/paper towel (51.2% (S.E. 3.8) of operations that used a teat wash method). Neither a predip or teat wash method was used on 5.3% (S.E. 1.0). Automatic takeoffs were used on 36% (S.E. 1.8) of all operations with use increasing with increasing herd size. More than 94% (S.E. 1.0) of operations used a post-milking teat disinfectant (postdip). Iodophores and chlorhexidine were the most commonly used disinfectants in postdips. Most operations reported milking cows twice daily (93.6% (S.E. 0.8) of operations representing 78.6% (S.E. 1.7) of cows). Coliform mastitis vaccines were administered to the majority of cows on 35.8% (S.E. 2.0) of operations representing 57.1% (S.E. 1.8) of all cows. Intramammary dry cow therapy was administered to all cows at dry off on 75.2% (S.E. 1.9) of operations. The majority (42.1% (S.E. 1.8) of cows) was treated with a dry cow product containing cephapirin, followed by the combination of penicillin G/dihydrostreptomycin (31.7% (S.E. 2.0) of cows).

Ruminant Nutrition: Dairy calves and replacement heifers

82 Responses to feeding Apex plant extracts to neonatal calves via the milk replacer and starter. T. M. Hill*[1], J. M. Aldrich[1], and R. L. Schlotterbeck[1], [1]*Akey.*

Feeding Apex plant extracts improved 0 to 42-day gains by 8 percent when included in an all milk protein milk replacer (MR) and 17 percent when included in a milk plus soy protein MR (no Apex in the starter) in a previous trial. In this trial 48, approximately 3 day old calves (40 kg), were fed a milk plus soy protein MR (20 percent CP and 20 percent fat, 454 g per head daily) with and without .05 percent Apex and an 18 percent CP starter with and without .05 percent Apex. All MR and starters contained decoquinate. Starter and water was fed from 0 to 56 days and MR was fed from 0 to 42 days. Calves were housed in a naturally ventilated nursery with no heat in individual pens. Data were analyzed as a completely randomized block design with factors in the model of block (row in nursery), MR (Apex or no Apex), starter (Apex or no Apex), and MR by starter. There were no significant ($P > .1$) interactions of MR by starter. Calves fed Apex via the MR had higher rates of gain, consumed more starter, and had better feed efficiency ($P < .05$) from 0 to 42 days. They also had firmer fecal scores and required fewer medical treatments ($P < .05$) from 0 to 42 days. Calves fed Apex via the starter had higher rates of gain and better feed efficiency ($P < .1$) from 0 to 56 days. Calves fed Apex via the MR consumed more ($P < .1$) starter from 0 to 56 days. Calves fed Apex via the starter consumed more ($P < .1$) starter and had greater hip width changes post-weaning. Compared to calves not fed Apex from 0 to 56 days, gains were 4.9 kg, 5.4 kg, and 8.0 kg greater and starter intakes were 9.4 kg, 8.3 kg, and 11.3 kg greater when Apex was in the MR, starter, or both feeds, respectively. Apex is a trademarked product of Braes Feed Ingredients.

Key Words: Calf, Milk replacer, Plant extract

83 Effect of feeding neonatal calves milk replacers containing a blend of vegetable and animal fats. T. M. Hill*, J. M. Aldrich, and R. L. Schlotterbeck, *Akey.*

Milk replacers (MR) for herd replacement calves commonly contain all animal fat, which contain fatty acids with predominately 16 and 18 carbons. Shorter chain fatty acids may be more digestible and have antimicrobial properties, while C18:2 and C18:3 fatty acids might aid in immune function. In two trials, a MR formulated with a portion of the animal fat replaced with a blend of vegetable fats high in 8 to 14 carbon fatty acids, plus C18:1 and C18:2 fatty acids (MRV) was compared to a MR formulated with all animal fat (MRA). In each trial, 24 calves (approximately 3 days old and 43 kg) were fed 454 g per head daily of a 20 percent all milk protein and 20 percent fat MR from 0 to 42 days and an 18 percent CP starter and fresh water from 0 to 56 days. Both feeds contained decoquinate. Data were analyzed as a completely randomized design. In trial 1, daily gains and starter intakes for calves fed MRV were improved ($P < .05$) 7% from 0 to 42 days compared to calves fed MRA. Daily gains and starter intakes for calves fed MRV were improved ($P < .05$) 6 and 10 percent, respectively, from 0 to 56 days compared to calves fed MRA. There were 26 percent fewer total abnormal fecal score days (fecal scores >2 on a 1-5 system; 1 being normal, 5 being watery) for calves fed MRV vs. MRA. In trial 2, daily gains and feed efficiency for calves fed MRV were improved ($P < .05$) 6 and 7 percent, respectively, from 0 to 42 days, compared to calves fed MRA. Daily gains for calves fed MRV were improved ($P < .05$) 6 percent from 0 to 56 days compared to calves fed MRA. There were 21 percent fewer total abnormal fecal score days for calves fed MRV vs. MRA. Calves fed MRV were approximately 2 kg heavier after the 56-day trials and scoured less than calves fed MRA.

Key Words: Calf, Milk replacer, Fatty acids

84 Characterization of a colostrum replacer containing IgG concentrate and growth factors. C. J. Hammer*[1], J. D. Quigley[2], L. Ribeiro[2], and H. D. Tyler[1], [1]*Iowa State University, Ames,* [2]*APC, Inc., Ames, IA.*

Objective of this study was to characterize absorption of colostrum replacer (CR) or supplement (CS) containing fractions of bovine plasma. Immunoglobulin concentrate (IGC) was prepared from bovine abattoir blood to a final purity of approximately 90%. Bovine blood was also processed to produce a fraction containing elevated concentrations of IGF-1 and TGF-β (GF). Both IGC and GF were spray-dried and blended with other ingredients to produce CR (30% IgG) or CS (15% IgG) containing 0 or 5% GF. Holstein bull calves (n = 40) were removed from the dams immediately after birth and assigned to one of five treatments: 1.9 L of maternal colostrum at 1 and 8 h of age (MC); 1.9 L of CS at 1 and 8 h of age to provide 150 g of IgG (LC); 1.9 L of a CS with GF at 1 and 8 h of age to provide 150 g of IgG (LG); 1.9 L of CR at 1 h of age to provide 150 g of IgG and 1.9 L of a commercial milk replacer (MR) at 8 h of age (HC); and 1.9 L of a CR with GF at 1 h of age to provide 150 g of IgG and 1.9 L of a commercial MR at 8 h of age (HG). Blood was collected by jugular venipuncture at 0 and 24 h for determination of plasma IgG. Six calves fed HG, HC, and MC received an oral xylose solution (0.5% g/kg body weight) at 2 d of age. Jugular blood samples were obtained at 0 and 2 h after xylose ingestion. Apparent efficiency of IgG absorption (AEA) was higher ($p=.02$) for calves fed HC and HG compared to those fed LC and LG and was lower ($p=.03$) for calves fed LG and HG compared to those fed LC and HC. IgG concentrations at 24 h were highest ($p<.0001$) in calves fed MC compared to other calves and were higher ($p=.048$) in calves fed HC and HG compared to LC and LG. Calves fed LG and HG had lower ($p=.02$) IgG concentrations at 24 h of age compared to those fed LC and HC. Xylose absorption was not influenced by treatment. These results indicate that 150 g of IgG provided in one dose soon after birth is superior to 150 g of IgG fed in two doses 7 h apart.

Key Words: Colostrum, Calf, Xylose

85 Inclusion of vegetable fats in calf milk replacers. M. L. O'Brien, K. J. Touchette, J. A. Coalson, and R. M. Costello*, *Merrick's Inc. Union Center, WI USA.*

Due to increased concern over feeding species to species feeds and to new manufacturing technology, the use of vegetable fats in milk replacers may be an alternative to feeding animal fats. Two studies were conducted to evaluate the performance of calves fed milk replacer containing vegetable fat. Both experiments utilized a randomized complete block design with initial weight as the blocking factor. Calves on Exp. 1 were assigned to a diet of all animal fat (**ANIMAL**), 100% vegetable fat containing Palm Oil as 85% of the fat and Coconut Oil as 15% of the fat (**PALM**), or a 100% vegetable fat diet containing Soy Oil as 85% of the fat and Coconut Oil as 15% of the fat (**SOY**). Calves on Exp. 2 were assigned to a diet of all animal fat (**ANIMAL**), as ANIMAL with 15% of the fat from Coconut Oil (**15%COCO**), or 100% vegetable oil containing 85% of the fat as Soy Oil and 15% of the fat as coconut oil (**SOY**). For both experiments, milk replacers were formulated to contain protein and fat levels at 20% of DM and were fed at 454 g/d reconstituted to 12% DM. Holstein bull calves (n=60 for Exp. 1, n=120 for Exp. 2) were purchased from an area sale barn. Calves were housed in individual hutches with water available free choice from d 0. A high quality, commercial calf starter was available free choice beginning on d 1. Feed intake, incidence of scours and antibiotic treatments were recorded daily. Calves were weighed weekly. Calves were