587 In vitro evaluation of four bacterial species as potential probiotics in the rumen. T. W. Priambodo, J. Hummel, S. Kehraus, and K.-H. Südekum*, *University of Bonn, Bonn, Germany.*

The current study evaluated effects of four potential probiotic bacterial cultures on ruminal in vitro gas production, and on fermentation acid and ammonia concentrations to compare the capability of probiotics and their survival during in vitro ruminal fermentation. Bacterial strains, namely *Lactobacillus buchneri, L. brevis, Enterococcus faecium* and *Propionibacterium jensenii* were investigated at two different concentrations, namely 10^7 and 10^9 colony forming units (cfu)/ml. The Hohenheim gas test was employed to determine in vitro gas production at 8- and 24-h incubation time, using four different ratios of grass silage to mixed concentrate (dry matter basis; 100:0; 75:25; 50:50; 25:75). The concentrations of ammonium (NH_4^+) and volatile fatty acid (VFA) were determined as well as probiotic cell counts to estimate probiotic activity and persistency. Protozoa were enumerated to estimate the effects of bacterial strains on the rumen fauna. Gas production and individual and total VFA concentrations were affected by probiotic colony concentrations as well as diet type, but only *P. jensenii* at 10^9 cfu/ml increased ($P < 0.05$) gas and VFA production over control values. Probiotic colony counts decreased over the 24-h incubation period, and were least pronounced for *P. jensenii*, indicating that it was the most adaptable strain. Treatments had no ($P > 0.05$) effects on NH_4^+ concentration and protozoal numbers. In general, autoclaved probiotics produced similar concentrations of gas and NH_4^+ as the live probiotics, which likely was a result of fermentation of the carrier material. Only the live *L. brevis* and *P. jensenii* produced more ($P < 0.05$) gas than their autoclaved forms.

Key Words: probiotics, rumen, in vitro

588 Feeding behaviour of wethers fed a temperate pasture with different time of access to food and supplemented or not with additives. A. Pérez-Ruchel[1], J. L. Repetto*[2], M. Michelini[1], L. Pérez[1], G. Soldini[1], and C. Cajarville[1], [1]*Departamento de Nutrición Animal, Facultad de Veterinaria, Montevideo, Uruguay,* [2]*Departamento de Bovinos, Facultad de Veterinaria, Montevideo, Uruguay.*

The effect of time of access to food (TAF) and supplementation with selected additives on feeding behaviour was studied. Twenty-four wethers were blocked by weight and fed fresh forage (*Lotus corniculatus,* CP 14%), housed in metabolic cages and allocated to 4 treatments. AD animals had access to forage all day (AD); R, RB, RS had forage available 6 h/day. RB and RS were supplemented (2% DMI of 75% NaHCO3-25% MgO and 6.2×10^9 UFC/d of *Saccharomyces cerevisiae*, respectively). Feeding behaviour was recorded for each animal every 3 minutes for 12 h via visual observation by trained operators. Four categories were used to classify animal behaviour: eating, ruminating, drinking and resting. Parameters were compared between treatments by GLM considering 'treatment' and 'block'. Orthogonal contrasts were performed on data to study the effect of TAF, use of additive and the type of additive. Animals with restricted TAF exhibited reduced eating and ruminating time (40% and 36%, respectively) and increased the resting time (47%) in comparison with those fed all day. Animals fed all day masticated 1.6 more times than animals fed 6h/d. The use of additives had no effect on the feeding behaviour. Restricted TAF changed the feeding behaviour of wethers fed forage.

Table 1.

Cumulative time, min	Treatments					P contrast		
	AD	R	RB	RS	SE	AD vs R + RB + RS	R vs RB + RS	RB vs RS
Eating	328.5	187.5	215.5	194.5	18.1	<.001	ns	ns
Ruminating	169.5	106.0	106.0	114.5	12.6	<.001	ns	ns
Mastication*	498.0	293.5	321.5	309.0	15.4	<.001	ns	ns
Drinking	4.5	4.0	3.0	0.5	1.52	ns	ns	ns
Resting	217.5	422.5	395.5	410.5	15.7	<.001	ns	ns
Ruminating/ resting	0.53	0.66	0.50	0.67	0.12	ns	ns	ns
Mastication/ resting	2.41	0.71	0.83	0.78	0.13	<.001	ns	ns

*: eating + ruminating; SE: standard error; ns: non significant (P>0.05)

Key Words: feeding behaviour, magnesium, *Saccharomyces cerevisiae*

Small Ruminant: Nutrition

589 The effects of replacing alfalfa hay with fresh citrus pulp on ruminal fermentation and ewe performance. J. L. Sparkes, Y. T. E. Fung, I. van Ekris, R. D. Bush, and A. V. Chaves*, *The University of Sydney, Faculty of Veterinary Science, Sydney, NSW, Australia.*

Two studies were conducted to determine the effects of replacing alfalfa hay with fresh citrus pulp in Merino ewe diets: (i) an *in vitro* study which measured ruminal fermentation; and (ii) an *in vivo* study in which twelve Merino ewes pre- and post-lambing were fed treatments in a cross-over design over 120 d to evaluate effects on ewe performance (i.e. dry matter (DM) intake (DMI), average daily gain (ADG) and wool growth). In both the *in vitro* and *in vivo* studies, the control treatment consisted (in diet DM) of alfalfa hay (91.3%), lupins (8.3%) and phosphate (0.42%), while the citrus pulp treatment consisted of alfalfa hay (57.7%), lupins (9.5%), phosphate (0.48%) and fresh citrus pulp (32.3%). Data were analyzed with the mixed model procedure of SAS. In the *in vitro* study, gas production, total volatile fatty acid (VFA) yield, proportion of propionic acid to total VFA and *in vitro* dry matter digestibility (IVDMD) were higher (P<0.02) in the citrus pulp treatment compared to the control treatment. In contrast, *in vitro* ammonia production, pH and the acetate to propionate ratio were lower (P<0.03) for the citrus pulp treatment compared to the control treatment. In the *in vivo* study, DMI of ewes fed the citrus pulp diet was lower than their control ewe counterparts throughout both the pre- and post-lambing periods (928.9 vs. 1115.0 g/d pre-; 1285.0 vs. 1620.3 g/d post-lambing, P<0.01), however ADG was similar (P=0.12). Wool growth parameters and lamb performance did not differ (P>0.32) between treatments. In summary, the *in vitro* study demonstrated that the replacement of 30% of an alfalfa diet with fresh citrus pulp improved total VFA yield, increased total gas production and improved IVDMD, while decreasing the production of ammonia, acetic acid and rumen pH. In addition, the *in vivo* study demonstrated that the replacement of 30% of an alfalfa diet with fresh citrus pulp pre- and post-lambing decreased DMI but did not affect a ewe's performance in terms of ADG and wool growth. These findings would be of significant interest to producers endeavoring to control feed cost while maintaining productivity.

Key Words: in vitro, Merino sheep, wool growth

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590 Effect of yeast (*Saccharomyces cerevisiae*) culture supplementation to medium-quality hay on nutrient digestibilities by goats of two different body sizes. D. V. G. Krishna Mohan[1], J. Hummel[2], and K.-H. Südekum*[2], [1]*Sri Venkateswara Veterinary University*, *Tirupati, Andhra Pradesh, India*, [2]*University of Bonn*, *Bonn, Germany*.

Yeast (*Saccharomyces cerevisiae*) products may exert beneficial effects on ruminant productivity by either increasing fermentability of fiber and/or allowing rumen microbes to more effectively metabolize end-products of ruminal starch fermentation. The objective was to evaluate the possible effect of increased fiber fermentability, independent of metabolism of starch fermentation end-products. Twenty male goats (German Improved Dairy Goat) were housed in individual pens and assigned to four treatments of five animals each in a 2×2 factorial design to study the effects of body weight (BW; heavy [HE], mean BW 45 kg, and light [LI], mean BW 25 kg) and live yeast (Levucell® SC 20) supplementation (YEA, yeast product supplemented at 2.5 x 10^5 colony forming units/g hay; CON, without supplementation) on nutrient digestibility of a hay-only diet. A high-fiber, medium-quality grass hay was fed to treatments: 1 (HEYEA) and 2 (HECON), hay at 1000 g/d, and 3 (LIYEA) and 4 (LICON), hay at 600 g/d. A digestion trial (3 wk adaptation period and 1 wk total fecal collection period) was conducted to measure nutrient digestibilities of the hay. The digestibilities of dry matter, organic matter, ether extract and of fiber fractions (acid and neutral detergent fiber) were not different ($P > 0.05$) among treatments. Only crude protein (CP) digestibility was greater ($P < 0.001$) for heavy compared to light goats. Within the light goats, CP digestibility was lower for the YEA supplemented animals. In the present experiment, neither yeast product nor BW of young male goats affected nutrient digestibilities in the gastro-intestinal tract.

Key Words: yeast, grass hay, digestibility

591 Performance of lambs fed ensiled orange pulp treated with exogenous enzymes. H. Gado*[1], A. Z. M. Salem[2,4], H. Alsersy[3], B. E. Borhami[2], and M. El-Adawy[2], [1]*Faculty of Agriculture, Ain Shams University*, *Egypt*, [2]*Faculty of Agriculture, Alexandria University*, *Egypt*, [3]*Animal Production ARC, Ministry of Agriculture*, *Egypt*, [4]*Universidad Autónoma del Estado de México, Centro Universitario UAEM, Temascaltepec, México*.

Eighty four Ossimi male sheep (21.0 ± 0.5 kg LW) were used in this study. The animals were randomly assigned among three experimental treatments using a complete block design. The period of this trial extended for 90 d. The objectives of this study were to evaluate the effects of ensiled orange pulp (EOP) in lamb diets in presence of exogenous enzyme on growth performance, digestibility and some blood metabolites (i.e. glutamic oxaloacetic transaminase (GOT) and glutamic pyruvic transaminase (GPT). The EOP was mixed (1:1) with rice straw (3-5cm) sprayed with ZAD (2 L/ton straw) as a liquid product which contains live anaerobic rumen bacteria and their enzymes, and ensiled for 30 d. The ensiled mix replaced 15% of the concentrate mix (corn, 30%, sugar cane molasses, 5.5%, cottonseed cake, 11% and soybean meal, 5%) in Diet 2 and similarly in Diet 3 plus 0.5% of ZADO/ton (product with natural enzymes derived from rumen bacteria). The addition of ZAD to the ensiled mix resulted in a decrease ($P < 0.05$) in the total phenolics, saponins and aqueous fraction. Digestibility coefficients for DM, OM, CP, CF, NDF and ADF were highest ($P < 0.05$; SEM = 0.36) for diet 3 followed by diet 2. Accordingly, the TDN of diet 3 was improved ($P < 0.05$; SEM = 0.24) in comparison with control (72.4 vs 68.8%, respectively). Average daily gain (ADG) was highest (250 g/d) for Group 3 followed by Group 2 (202 g/d) and control one (128 g/d).

Feed efficiency was improved in Group 3 (3.2 kg feed /kg LW) and lowest ($P < 0.05$; SEM = 0.17) was for Group 1 (6.2 kg feed/kg LW). There were no differences between groups for the results of GPT and GOT. Meanwhile, there was an increase ($P < 0.05$; SEM = 0.06) in blood serum globulin and a decrease in the cholesterol with Diet 3 .The results reflect the possibility of replacing grains with citrus pulp silage and better results were obtained with the addition of ZAD and ZADO.

Key Words: orange pulp, ZAD, digestibility

592 Effect of tea saponin and soybean oil on performance of growing lambs and protozoa community in the rumen. H. L. Mao*, J. K. Wang, and J. X. Liu, *Institute of Dairy Science, Ministry of Education Key Laboratory of Molecular Animal Nutrition, Zhejiang University, Hangzhou, P.R. China*.

Thirty-two Huzhou male lambs were used to investigate the effect of tea saponin (TS) and soybean oil (SO) on performance of growing lambs and the protozoa community in the rumen. Diets were formulated as a 2 $\times$ 2 factorial with TS (0 or 3g/d) and SO (0 or 3% of DM) and were fed for 60 d. Feed intake and refused, and body weight gain were recorded every two wk. After the feeding trial, four lambs in each treatment were slaughtered to obtain the rumen samples for analysis of protozoa community by using real-time PCR and denaturing gradient gel electrophoresis (DGGE) technique. Populations of protozoa were expressed as a proportion of total rumen bacterial 16S rDNA. The protozoa diversity and similarity were determined on the base of the position and number of bands in the DGGE gel. No significant effects were observed on feed intake and daily gain in growing lambs by inclusion of TS or SO in the diets ($P > 0.05$). Rumen protozoa population was decreased markedly when TS or SO was included into the diets, compared with the control ($P < 0.05$). A tendency was observed for a TS $\times$ SO interaction in the relative abundance of protozoa ($P = 0.08$). Six major bands occurred, but their abundance was different among the dietary treatments. Based on the results of sequence analysis, these bands were classified to genus *Epidium*, *Entodinium*, *Eudiplodinium*, and *Polyplastron*. The band representing genus *Eudiplodinium* only occurred for lambs fed the control or the SO-supplemented diet, while lambs supplemented with SO had the band representing genus *Polyplastron*. However, no significant difference was observed in protozoa diversity among the different diets ($P > 0.05$). From the present study, it is inferred that addition of TS and supplementary SO had an inhibitory effect on the protozoa population, but did not affect the productive performance of lambs and protozoa diversity in the rumen.

Key Words: rumen protozoa, soybean oil, tea saponin

593 The effects of replacing dried citrus pulp with barley grain on the performance of Iranian Saanen kids. Abasali Naserian*, Mohammad Mahdi Sargolzehi, and Hojat Gholizadeh, *Ferdowsi University of Mashhad, Mashhad/ Khorasan Razavi Province/Iran*.

This study was conducted to evaluate the effect of replacing barley with dried citrus pulp on the performance of growing kids. Twelve female Iranian Saanen weaned kids aged 88 ± 3 d with live weight 7 ± 0.7 kg were used in a completely randomized design. Kids were housed in well-ventilated individual metabolic cages. There were 3 treatments (n = 4 kids/treatment). The dietary treatments were T1, 30% lucerne with 70% concentrate supplement; T2 and T3, 7 and 14% of barley grain in supplements were replaced with dried citrus pulp, respectively. Each

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animal was kept and fed in a separate cage during the entire experiment (60 d). Daily intake was determined. The growth of animals was monitored every 15 d. Rumen fluid was collected by stomach tube and pH measured. Blood samples were collected from each animal at the end of experiment via jugular vein 2 h after morning feeding. The results are shown in Table 1. Significant difference (P < 0.05) occurred for DMI, average daily gain, feed efficiency, rumen fluid pH and blood urea nitrogen (BUN). The pH of rumen tended to increase as the level of citrus pulp increased. Dry citrus pulp in ration of growing kids is not able to support requirements like starch sources, but citrus pulp could be incorporated into ruminant ration.

Table 1. Means of feed intake, gain, FE, rumen fluid pH, BUN and serum glucose

	T1	T2	T3	SEM
DMI (g/d)	849a	835b	793c	10.22
Gain (g/d)	198a	186b	167c	0.26
Feed efficiency	4.20	4.56	4.78	0.24
Rumen fluid pH	6.28a	6.41b	6.62b	0.004
BUN (mg/dL)	30a	31b	35c	0.06
Glucose (mg/dL)	51	51	52	0.07

Key Words: Saanen kids, citrus pulp, growth

594 Empirical modeling of the utilization of energy and of the methane production in dairy goats. D. Sauvant* and S. Giger-Reverdin, *AgroParistech-INRA, Paris, France.*

The objective was to develop a model of energy utilization and methane production in dairy goats by meta-analysis. A data base was built from 7 publications, number of experiments (nexp) was 14 including 37 (n) treatment groups. The following parameters, expressed on a metabolic live weight basis (MLW), were collected: Metabolizable energy intake (MEI/MLW = 224.1 ± 97.9 kcal/kgMLW; n = 37), energy losses as methane (ECH4 = 21.9 ± 8.5 kcal/kgMLW, n = 37), net energy used for milk production for lactating goats (NEL/MLW = 76.1 ± 40.9 kcal/kgMLW, n= 27), energy balance (EB/MLW = 37.3 ± 22.5 kcal/kgPM, n = 37), Energy digestibility 70.3 ± 5.6% and percentage of MEI loss as methane 10.3 ± 2.1%. The various items were correlated, thus the sum of (NEL+EB)/MLW was closely related to MEI/MLW, the intra experiment equation was: (NEL+EB)/MLW = −68.1 + 0.70(± 0.03) MEI/MLW (n = 37, nexp = 14, R2 = 0.99, RMSE = 4.3 kcal/MLW). These coefficients suggest that the efficiency of ME intake to milk and body reserves is 70%, slightly better than some proposed values. This could be the outcome of the increase of the dietary concentrate percentage with higher levels of milk production. Maintenance requirements were close to present values proposed by INRA since 1978 (68.1 vs 65.3 kcal NEL/MLW). This value corresponds to 97.3 kcal MEI/MLW. The results allowed to predict daily methane production of a goat in function of its LW and 3.5% FC milk yield: CH4 (g/d) = 0.41 LW + 6.70 FCMY (n = 37, R = 0.87, RMSE = 6.9 g/d). Thus a dairy goat of 70 kg LW with a 3 kg FCMY produces 49 g CH4/d. The 22 residuals of this regression concerning mixed diets were curvilinearly linked with proportion of concentrate (resCH4 = −2.7 + 20.9 PCO − 29.2 PCO2, n = 22, nexp = 9, RMSE = 1.7 g/d). In conclusion, these models allow to update basic parameters of energy utilization and methane production by dairy goats.

Key Words: dairy goat, energy requirements, methane production

595 Evaluation of performance predictions of the Small Ruminant Nutrition System model using growth and body composition data of South African Mutton Merino and Dorper. A. Cannas*[1], A. Linsky[2], L. J. Erasmus[2], L. O. Tedeschi[3], W. A. van Niekerk[2], and R. Coertze[2], [1]*Dipartimento di Scienze Zootecniche, University of Sassari, Sassari, Sardinia, Italy*, [2]*Department of Animal and Wildlife Sciences, University of Pretoria, Pretoria, South Africa*, [3]*Department of Animal Science, Texas A&M University, College Station, TX.*

Since 2004, the biological model of the Cornell Net Carbohydrate and Protein System for sheep has been modified to include recent information, including a submodel to account for goat nutrition. This effort has led to the development of the Small Ruminant Nutrition System (SRNS) model. Considering the worldwide interest in nutritional models and the growth of the sheep industry in South Africa, the objective of this study was to evaluate the performance predictions of the SRNS model of South African Mutton Merino (late maturing) and Dorper breeds (early maturing) under South African conditions. The evaluation was carried out on the predictions of feed intake, average daily gain (ADG), empty body gain (EBG), and the composition of the EBG. Two different equations were compared to estimate energy value of gain and five different equations were compared to estimate the efficiency of conversion of ME to NE for gain. The original SRNS model gave the best predictions when compared to any of the modifications tested. Predictions of feed intake and ADG were accurate and precise with a low systematic bias (for feed intake: mean bias (MB) = 40 g/d, root of mean square prediction error (RMSPE) = 50 g/d, and r^2 = 0.95; and for ADG: MB = 2.4 g/d, RMSPE = 21.4 g/d, and r^2 = 0.76). However, the predictions for the EBG were on average over predicted (MB = 31 g/d, RMSPE = 38 g/d, and r^2 = 0.69). The model slightly over predicted both fat and protein contents of the EBG by 7.2% and 3.9%; respectively, showing high accuracy but very low precision, probably due to the fact that the measured range of variation of fat and protein content of gain was narrow. This evaluation indicated the SRNS model can be used under South African conditions, but modifications might be needed to more accurately predict body composition.

Key Words: growth, lamb, modeling

596 Factors affecting dietary intake and colostrum production in ewes. A. G. Fahey*, T. F. Crosby, and T. M. Boland, *School of Agriculture, Food Science, and Veterinary Medicine, University College Dublin, Belfield, Dublin, Ireland.*

The curvilinear increase in fetal mass in the final 8 wk of pregnancy and mammary development for lactogenesis highlights the necessity of nutrition in the pregnant ewe. Mortality associated with immunosupression in newborn lambs can be minimized through adequate availability of high quality colostrum. To analyze the effects of ewe profile and gestation characteristics on dietary intake and colostrum production, data were collected from a crossbred flock (n = 204 ewes). Daily average DMI, average crude protein intake (CPI), total colostrum yield and total immunoglobulin G (IgG) yield to 18 h post partum were measured. Ewes were divided into 3 groups based on their BW (high, n = 65; medium, n = 70; low, n = 69), gestation length (long, n = 69; medium, n = 66; short, n = 69), body condition score (BCS; high, n = 57; medium, n = 75; low, n = 72;) and lamb BW (large, n = 63; medium, n = 79; small, n = 62). High BW ewes had a higher DMI than low BW ewes (P < 0.05), while ewes with long gestation had a tendency to have lower DMI than ewes with short gestation (P < 0.10). High BW ewes tended to have a higher CPI than medium BW ewes (P < 0.10) and medium BW ewes had higher CPI than low BW ewes (P < 0.05). High BCS ewes had

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lower CPI than low BCS ewes (P < 0.01), while ewes that gave birth to high BW lambs had higher CPI than low BW lambs (P < 0.05). High BW ewes had higher IgG yield than medium and low BW ewes (P < 0.05). Ewes with long gestation lengths tended to have lower IgG yield than those with short gestation (P < 0.10), and high BCS ewes tended to have higher IgG yield than low BCS ewes (P < 0.10). However, large BW ewes had higher colostrum yield than ewes with a low BW (P < 0.05). Ewes with low BW lambs tended to produce more colostrum than ewes with high BW lambs (P < 0.10). The data show that ewe profile influences feed intake and colostrum production. A better understanding of these may lead to an improvement in late pregnancy nutrition and reductions in lamb mortality.

Key Words: dry matter intake, immunoglobulin, colostrum

ADSA Production Division Symposium: Driving Forces in the Dairy Industry That Will Change Dairy Farm Management

597 The dairy scientist's role in re-connecting the dairy food-chain. K. Murphy*, *Food-Chain Communications*, *Lee's Summit, MO*.

The ideal food-chain is defined as the group of people and organizations working together to effectively respond to the demands of food consumers. Recent actions by grocery retailers, quick-service restaurants and branded product manufacturers have caused the food-chain to instead function more antagonistically, more closely resembling nature's food chain, in which each species within the chain cannibalizes the other in order to survive. Dairy scientists play—and will continue to play—an increasingly important role in returning the food chain to the cooperative effectiveness indispensable to feeding a growing population. To be effective in their role, scientists and their institutions must appreciate the necessity to communicate science beyond their own bounds, learn to effectively communicate and translate the complexities of science into a common consumer vernacular, understand the nature of "my science vs. your science" characteristic of post-modernism, understand how physical science must mesh with humanities and social science in communicating with consumers.

Key Words: food chain, consumer communication

598 The welfare of dairy cattle: Problems and solutions for the coming decade. M. A. G. von Keyserlingk*[1], R. Rushen[2], A. M. de Passillé[2], and D. M. Weary[1], [1]*University of British Columbia*, *Vancouver, BC, Canada*, [2]*Agriculture and Agri-Food Canada*, *Agassiz, BC, Canada*.

Recent interest in animal welfare stems often from concerns related to intensive farming techniques. In many modern farms, especially in the industrialized world, dairy cattle are housed indoors, a system perceived by some as "unnatural" as it provides limited space and often a limited ability to engage in some natural behaviors. In contrast, many within the dairy industry see advantages to intensive, indoor systems, including protection of cows from the elements and the provision of high quality diet. Thus different people can reach different conclusions about management systems by favoring different welfare indicators. Clearly the best solutions will be those that satisfy the range of concerns (in this case allowing for natural behaviors that are important to the animal, along with good health and production). Taking this approach we provide a critical summary of the available welfare literature on intensively managed dairy cattle and show how scientific research can provide ways of resolving current concerns. Specifically we address dairy cattle welfare from three perspectives: improving health, reducing pain and distress, and facilitating natural behavior. Four major areas of concern are reviewed: 1) calf health and rearing practices, 2) lameness and transition cow disease, 3) housing, including access to pasture and, 4) painful procedures like dehorning that cause considerable pain that can be avoided using the right techniques and analgesics, or like tail docking that prevents the animal from performing natural fly avoidance behaviors, and fails to provide clear advantages to either the animal or the producer. In each example we show how research can identify solutions that improve dairy cattle welfare while remaining practical for dairy producers. We also identify some of the major welfare concerns for intensively managed dairy cattle where research is still required.

Key Words: welfare, dairy cattle, behavior

599 Accelerating genetic improvement with SNP chips and DNA sequencing. C. P. Van Tassell*[1], P. R. VanRaden[1], G. R. Wiggans[1], L. K. Matukumalli[1,2], S. Schroeder[1], J. O'Connell[1,3], R. D. Schnabel[4], J. F. Taylor[4], E. J. Pollak[5], M. Munson[6], D. Bailey[6], and T. S. Sonstegard[1], [1]*USDA-ARS*, *Beltsville, MD*, [2]*George Mason University*, *Manassas, VA*, [3]*University of Maryland School of Medicine*, *Baltimore*, [4]*University of Missouri*, *Columbia*, [5]*Cornell University*, *Ithaca, NY*, [6]*Illumina, Inc.*, *San Diego, CA*.

The development of high-density single nucleotide polymorphism (SNP) assays is expected to have a profound impact on genetic progress in the U.S. dairy industry. In the 16 months since its initial availability, the Illumina BovineSNP50 BeadChip has been used to genotype nearly 20,000 Holsteins. These genomic data were included for the first time in the national dairy cattle genetic evaluation published by the USDA in January 2009. Substantial increases in genetic improvement have been predicted through the implementation of genome enabled selection. Currently, however, validation results are available only from the analysis of historic data, where populations have somewhat arbitrarily been divided into past and "future" populations. Availability of low-density but targeted SNP data could also dramatically impact genetic improvement. Low-density SNP data could be used to validate reported parentage and correct pedigree errors if comprehensive genotyping were conducted. These data could also be used to discover parentage and to more accurately characterize the degree of relatedness among animals in the population using genomics-based relationship coefficients. By accurately charactering the fractions of the genome inherited from each grandparent, genetic similarity that is currently described by statistical averaging using the pedigree could be refined to more accurately predict genetic merit early in life. Finally, individual animal genome sequencing is on the scientific horizon. Availability of such data could have implications beyond genetic improvement, and result in deeper understandings of basic biology, consequences of selection, and even animal and human health. Our ability to fully utilize these data will present enormous statistical and computational challenges.

Key Words: SNP, selection, genome

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