

379 Beneficial effects of mannan oligosaccharide on diet component digestibility and fermentation characteristics in the dog. L. C. Kappel¹, Y. Zhang¹, Y. Marcum¹, W. H. Taylor¹, W. G. Henk¹, P. Jowett¹, C. Hedlund¹, K. E. Newman², H-P. Healy³, and A. Kocher*³, ¹*School of Veterinary Medicine, Louisiana State University, Baton Rouge*, ²*Venture Laboratories, Lexington, KY*, ³*Alltech Inc., Nicholasville, KY*.

Adult Beagles (36) and mixed-strain hounds (4), in 8 groups of 5 dogs each, were used to evaluate organic matter digestibility of 4 diets having no fibrous ingredient (CON), beet pulp (BP), soybean hulls (SH), or cellulose (CEL), with or without 0.11% mannan oligosaccharide (MOS; Bio-Mos[®], Alltech, Inc., Nicholasville, KY). Analyzed total (and soluble) fiber percents, respectively, were: 8.1 (2.4), 15.3 (3.7), 16.7 (1.5), and 15.6 (1.7). The study conducted 6 times involved a 21-d adaptation period and a 5-d total fecal collection period. Insoluble fiber digestibility was greatest for SH diet whereas CON, BP, and CEL diets were similar. Insoluble fiber of SH was about 25% more fermentable than that of BP though nonsignificant. Soluble fiber digestibility was variable and not significantly different among fiber sources. The MOS increased soluble fiber digestibility across all fiber sources ($P < 0.05$; 72.9 vs 61.5%, on average), indicating a strong beneficial effect on microbial metabolism due to increased proliferation of the fermentation microbe population. In vitro fermentation of starch, BP, SH, or CEL was evaluated using inocula from feces of 12 dogs (3 from each of the CON and BP diets with and without MOS). Organic matter digestibility of BP and SH was improved with BP + MOS diet but not CON + MOS diet fecal inoculum, indicating that some adaptation period was required for MOS to lead to changes in microbial metabolism. However, fecal inoculum from dogs fed BP + MOS diet decreased acetate, propionate, and total volatile fatty acids using BP or SH substrates and fecal inoculum from dogs fed CON + MOS diet increased acetate and total volatile fatty acids using starch. Histology revealed the number of colonic mucous secreting goblet cells was greater for BP and SH than CON and CEL diets in response to amount of fermentation not fiber per se. Addition of MOS to dry dog food improved fiber digestibility and altered intestinal fermentation patterns.

Key Words: Canine, Fiber, Manno-Oligosaccharide

380 Effect of Bioplex organic trace minerals on copper, manganese, and zinc status of the canine. L. C. Kappel¹, J. F. Williams¹, G. R. Pettifer¹, H-P. Healy*², and A. Kocher², ¹*School of Veterinary Medicine, Louisiana State University, Baton Rouge*, ²*Alltech, Inc., Nicholasville, KY*.

A 24-wk study was conducted with 20 adult, mixed-strain hounds from five litters, housed two dogs per pen, to compare Cu, Mn, and Zn in serum, liver, and hair when feeding a control (CON) diet with an inorganic trace mineral premix or a diet supplemented with an organic trace mineral premix (OTM; Bioplex[®], Alltech, Inc., Nicholasville, KY) at equal mineral inclusion levels. One dog was removed from the OTM group for non-nutritional causes. Dogs used in this experiment were mature with low mineral requirements and adequate mineral status prior to the study. By analysis, the commercial dry basal diet (Animal Nutrition, Ogden, UT) had 10 ppm Cu, 29 ppm Mn, and 56 ppm Zn. Typical industry levels of 8 ppm Cu, 10 ppm Mn, and 140 ppm Zn were added in sulfate form to the CON diet or in proteinate form to the OTM diet. These mineral concentrations were probably above the dogs' mineral requirements. Jugular blood samples (8 mL) were taken at 0, 2, 8, 12, 16, and 24 wk two hours before feeding for serum mineral analysis (stored frozen). Liver samples (15-25 mg) were obtained by liver biopsy at 0, 12, and 24 weeks on test (stored frozen). Two 10 x 10 cm areas on the left side were closely clipped initially, and from one location hair was clipped at the skin at 4, 8, and 12 wk and from the other site hair was sampled at 12 and 24 wk. Over 24 wk, serum and liver mineral concentrations did not differ between diets and were in normal ranges for dogs. Although hair Zn levels did not differ significantly by dietary treatments, the OTM supplemented diet increased hair Cu ($P < 0.05$; 1-4 wk, 17.9 vs 12.9, and 9-12 wk, 11.1 vs 7.2 mcg/g) and Mn (main effect $P < 0.10$; 12.6 vs 9.7 mcg/g) in 4-wk interval hair samples, indicating better Cu- and Mn-proteinate uptake, utilization, different distribution in the body or a combination of the three than Cu and Mn sulfates in the CON diet. Trace mineral availabilities may be more easily demonstrated with growing dogs or those previously deficient, or when using supraoptimal trace mineral inclusion rates.

Key Words: Bioplexes, Canine, Trace Minerals

Extension Education - Dairy Science

381 Impact of conducting a dairy herdsman short-course in California. G. E. Higginbotham*¹, J. H. Kirk², C. C. Collar⁵, A. R. Castillo⁶, S. L. Berry³, B. A. Reed⁷, and J. D. Robison⁴, ¹*University of California Cooperative Extension, Fresno/Madera Counties*, ²*Veterinary Medicine Extension, University of California, Davis*, ³*Department of Animal Science, University of California, Davis*, ⁴*California State University, Fresno*, ⁵*University of California Cooperative Extension, Kings County*, ⁶*University of California Cooperative Extension, Merced County*, ⁷*University of California Cooperative Extension, Glenn County*.

Since 2001, University of California Cooperative Extension (UCCE) has conducted four 18-hour training programs at three different locations for dairy farm employees in the central valley of California. The program consists of classroom and hands-on teaching sessions. Session topics include raising replacement heifers, reproductive management, milking management, nutrition, hoof care, labor management and herd health. Material is presented in English with simultaneous translation for Spanish attendees. Over 120 dairymen, dairy workers and dairy industry representatives have attended the courses. To assess impact of materials taught, a survey was mailed to attendees (N=95) who attended one of the first three herdsman shortcourses and who were thought to have been currently employed on a dairy. Time since attendees attended the shortcourse ranged from 8 - 24 months. The survey was provided in both English and Spanish. Thirty-two former attendees returned the survey (34%). Of those responding, English was the first language for 63%. Of the twelve who indicated Spanish was their first language, only ten used the Spanish questionnaire version. All of the respondents indicated that the course met their expectations (33% strongly agreed; 66% agreed). All but one indicated that they would recommend the course to other herdsman. Nearly 66% of the respondents indicated that Spanish translation of presentations helped in their understanding of the materials. The previous dairy experience of those responding was 0-5 years, 45%; 6-10 years, 22%; and over 10 years, 32%. Overall, 41% of the attendees

indicated that they had begun to apply information they had learned in the classes. Hands-on laboratory exercises were found to be useful to most of the past attendees (calf necropsy, 94%; reproductive tracts, 91%; use of CMT, 91%; cow health, 97%; and foot trimming, 88%). Results from this survey demonstrate the need for a dairy herdsman shortcourse in order for dairy employees to improve their practical dairy skills.

Key Words: Herdsman, Training, Dairy

382 Assessing the Occupational Profiles of Senior- and Middle-level Dairy Managers. R. Stup*, L. Holden, and J. Hyde, *Pennsylvania State University, University Park*.

To effectively prepare dairy managers, educators must have a clear understanding of the competencies that lead to success. A competency is a knowledge or skill that an individual can apply to the successful completion of a task. The first objective of this project was to develop comprehensive sets of job competencies for middle managers and senior managers. These can subsequently be used for developing and updating dairy education curricula. The second objective was to assess the level of proficiency in each of the competencies among the current workforce to prioritize training needs.

Highly successful senior- and middle-level dairy managers were identified by Cooperative Extension educators and dairy industry personnel. These successful managers participated in focus groups with the objective of identifying, describing, and categorizing the competencies that lead to success. Four focus groups were conducted, two senior manager groups with a total of 17 people and two middle manager groups with a total of 12 people. Focus groups were professionally facilitated. The focus groups used a computer aided process known as a Customized Occupational Profile (COP) to identify general competency areas and the specific tasks that must be accomplished within those areas. The data resulting from the focus group processes were combined into comprehensive sets of job competencies for each respective manager position.

A survey was developed to assess the proficiency of existing middle and senior managers, relative to the identified competencies, within the framework of a gap analysis. The survey was distributed to dairy managers and the overall response rate was 37.2%. Respondents were asked to assess their own ability in each of the general competency areas. Competency-based research of this nature is widely used in other industries, but it is rare in dairy. Dairy educators in both Cooperative Extension and resident education will be able to use this information to update and improve educational programs.

Key Words: Dairy, Manager, Competency

383 The evolution of an extension education website - Dairy beef: Maximizing quality and profits. J.C. Dalton*¹, D.A. Moore², J. Kirk², M. Poe², and H. Sullivan³, ¹University of Idaho, Caldwell, ²University of California, Davis, ³New Mexico State University, Las Cruces.

In response to food safety and quality concerns in dairy market cattle, a 7-western state collaborative educational project was developed to create a distance-learning program for dairy producers, Cooperative Extension advisors, and dairy veterinarians to provide a consistent message about dairy beef food safety and quality. Faculty at the University of California, Davis, designed the program with input from dairy and meats scientists, veterinarians, and media specialists from Arizona, Colorado, Idaho, New Mexico, Oregon, and Washington. Individuals are encouraged, but not required, to register to view the website program materials. Between February 2003 and March 2004, 93 individuals registered for the course. According to FlashStats, the monthly page hit totals for March to December 2003 range from 8,904 to 27,412 hits. Following publication of an article about the development of the Dairy beef educational program in the Journal of Dairy Science, there were over 8,000 page hits in the first week of January 2004. The curriculum modular format complements the role of Cooperative Extension faculty through flexible delivery via the Internet or by CD ROM. The curriculum also has the versatility to be used in a workshop setting by a veterinarian, or even a dairy owner. Furthermore, the modular format allows for flexibility when adding, changing, or marketing new segments to users. When BSE was found in a dairy cow in Washington, project members were quickly able to assess the situation, find useful, existing links to educate dairy producers and veterinarians, and add new information to the Dairy beef website. In response to suggestions from in-residence programs and website course evaluations, the project team is producing training modules for Spanish speaking dairy employees. Dairy beef: Maximizing Quality and Profits (<http://dairybeef.ucdavis.edu>) is a flexible distance education tool to educate dairy and allied industry personnel about dairy beef food safety and quality.

Key Words: Dairy Beef, Food Safety

384 Businessense: Teaching dairy producers best management practices in business and information management. B. J. Hilty* and L. A. Holden, *Pennsylvania State University, University Park.*

Operating a dairy business involves considerable risk. Financial risk can be managed through sound decision-making. Accurate information concerning business performance is needed for sound decision making. An educational program, Businessense, was developed to improve decision making skills of Pennsylvania dairy producers through the adoption of best management practices in business and information management. This program was an interactive three-session workshop consisting of lectures, hands-on business analysis exercises and group discussions. Forty-five producers participated in the program. Each producer was required to submit data to complete a comprehensive business analysis. Participants also used an Excel spreadsheet, DairyCOPS (Cost of Production System), to calculate their production costs per hundred pounds of milk. Data from both analyses was summarized and presented to participants so they could see where their operation ranked among the sample of farms. Group discussions addressed issues such as investment management, cost control and production efficiency, which were previously addressed in lectures. Five key financial ratios for evaluating business performance and five key production indicators for evaluating herd performance were identified. Participants were given a pre and post test to identify these ten indicators. Less than 10 percent of participants were able to identify more than one correct financial ratio, while less than 20 percent were able to identify more than two key production indicators

on the pre-test. On the post-test over 70 percent of participants correctly identified four to five financial indicators and 98 percent correctly identified four to five production indicators. Businessense effectively taught producers how to implement best management practices in business and information management. Regular analysis of key indicators will positively impact dairies over time through better decisions.

Key Words: Dairy, Business, Management

385 Minnesota 4-H Gopher Dairy Camp: A Youth Learning Experience. B. J. Heins*, L. B. Hansen, and A. J. Seykora, *University of Minnesota, St. Paul.*

The Gopher Dairy Camp provided an exceptional 3-day opportunity for 4-H and FFA youth to participate in dairy showmanship, dairy judging, dairy workshops, and to interact with other youth participants. The camp provided four educational workshops consisting of artificial insemination, dairy heifer nutrition, corrective mating of dairy animals, and linear classification and scoring of dairy cows. The workshops were followed by a 'mock' dairy auction where youth purchased dairy heifers to prepare for the showmanship contests the next day. On the second day, professional dairy fitters were brought in to help teach and assist the campers about the basics of fitting a heifer and dairy showmanship. In the afternoon the youth participated in an ethics training seminar and a showmanship contest followed. A fun evening activity was planned where youth could interact and relax. The evening activity in 2003 was a Minnesota Twins game. The third day involved dairy leaders presenting dairy judging workshops, teaching the basics of dairy judging, which was followed by a dairy judging contest with 3 classes. Program evaluation by youth indicated that the camp was highly successful (4.6 on a 5-point scale). Group Fitting demonstrations (4.5), Activity Night (4.8) and Gopher Gold Auction (4.4) were also highlights among the participants. Approximately 50% of the costs were provided by various dairy industry sponsors and 4-H foundations. Seventy-four youth were registered for the camp and the participants paid a registration fee of \$75. Many alumni and industry professionals made the camp a huge success. Based on the high ratings received, the planning committee decided to continue with the camp into the future. The results indicated the Gopher Dairy Camp was enjoyed by all.

Key Words: 4-H, Youth, Dairy

386 Western integrated nutrition and nutrient management education (WIN²ME) for the nutrition and nutrient management professional. J. H. Harrison*¹, L. M. VanWieringen¹, R. L. Kincaid¹, A. Hristov², R. Sheffield², M. Gamroth³, P. French³, and T. Downing³, ¹Washington State University, Puyallup, ²University of Idaho, Moscow, ³Oregon State University, Corvallis.

The US EPA released new guidelines for Concentrated Animal Feeding Operations and Animal Feeding Operations in 2003. Under the new guidelines, CAFO/AFOs are required to develop a Nutrient Management Plan. One form of a Nutrient Management Plan is a Comprehensive Nutrient Management Plan and is defined in the Natural Resources Conservation Service National Planning Procedures Handbook. There are six components of a CNMP: 1) Feed Management, 2) Manure and Wastewater Handling and Storage, 3) Nutrient Management, 4) Land Treatment, 5) Record Keeping, and 6) Other Manure and Wastewater Utilization Options. Feed represents the largest import of nutrients to the farm, followed by commercial fertilizer. Feeding Management opportunities currently exist to reduce imports of nutrients, particularly nitrogen and phosphorus. The technologies and approaches to achieve these reductions vary in their degree of economic feasibility and environmental impact. Agricultural professionals need to understand the probable impact of changes in feeding management both from an economic and an environmental standpoint. The intended audience is staff of the NRCS, Conservation Districts, Nutrient Management Consultants, Nutrition-Management Consultants, and designated Nutrient Management Specialists of large animal operations. Specific objectives are: 1) provide training to Ag Professionals in feed management concepts and practices that minimize the import of nutrients to the farm and provide economic and environmental sustainability, 2) provide training in the use of computer models and software for strategic ration balancing, whole farm nutrient balance, and whole farm economics, and 3) develop educational materials that are specific to the Pacific Northwest regional

animal industries while utilizing national curriculum developed to address nutrition in the context of nutrient management. The curriculum has been developed using a 101 and 201 level approach.

Key Words: Extension, Nutrient Management, Environmental

387 Use of a dairy whole farm phosphorus balance education tool (dairy WFPBET) to teach dairy producers and their advisers nutrient management concepts at the whole-farm level. J. H. Harrison*¹, T. Nennich¹, and A. Rotz², ¹Washington State University, Puyallup, ²USDA/ARS, University Park, PA.

All dairy farms in the state of Washington are now required by law to have a certified nutrient management plan. These plans are nitrogen based; however, in early 2003, EPA released new CAFO guidelines to require that nutrient management plans consider phosphorus (P) as well. The objective is to encourage producers to actively use their nutrient management plans as a part of their overall farm management. To better prepare producers for this change, a spreadsheet based education tool was developed in Excel to demonstrate whole farm concepts related to nutrient balance with a focus on P. The goals in developing the tool were: 1) to use a simple interface viewed on a single page (worksheet), 2) to use input information readily available on most dairy farms, and 3) to use terminology and calculations consistent with a program developed by NRCS that is used in writing nutrient management plans for Washington dairy farms. The inputs required to determine a farm balance are herd milk production, number of milking cows, dry cows, and heifers, DMI of lactating cows, P content of lactating cow rations, fertilizer import, land in forage crops, yield and P content of forage crops, and estimated availability of P in manure. Output of the analysis includes the manure P available to crops and the whole farm balance of P. This educational tool is used to demonstrate the effects of management changes such as reduction in diet P, level of milk production, custom raising of heifers, forage yield and type, and the use of winter cover crops.

Key Words: Nutrient Management, Environment, Phosphorus

Forages and Pastures: Forages in Dairy Production

389 Grazing behavior of late lactating dairy cows under continuous stocking. H. Z. H. Taweel*, B. M. Tas, J. Dijkstra, and S. Tamminga, *Department of Animal Sciences, Animal Nutrition Group, Wageningen University, Wageningen, The Netherlands.*

This experiment aimed at studying the behavioral strategies grazing dairy cows employ to satisfy their nutritional needs as the day progresses. For this purpose the day was divided into three main periods (6:00 to 12:00 h, 12:00 to 18:00 h and 18:00 to 24:00 h) where the three main grazing bouts (dawn, afternoon and dusk) of dairy cows usually occur. Four late lactating rumen-cannulated dairy cows were used in a repeated measures design, with the grazing bout as the within subjects factor. The cows had access to a 1-ha grass sward under a continuous stocking system, which assured ad libitum herbage allowance. To estimate dry matter intake (DMI), bite rate, bite mass (BM) and intake rate at the three bouts, cows were rumen-evacuated at 6:00, 12:00, 18:00 and 24:00 h and jaw recorders were fitted to the cows between these time points. Time spent eating by dairy cows at the dusk grazing bout was much longer ($P < 0.05$) than that at the other two grazing bouts and made about 40 % of the daily total eating time. Total grazing jaw movements (TGJM) rate was constant during the day at around 75/min. Bite rate increased ($P < 0.05$) from 54 to 61/min, but chewing rate decreased ($P < 0.05$) from 20 to 16/min as the day progressed. BM (mg DM/bite) increased ($P < 0.05$) from 400 to 563 as the day progressed, but that was not due to increased bite dimensions, rather it was due to increased DM content of the grass at dusk time, which increased from 19 to 25%. Consequently, both intake rate and DMI increased ($P < 0.05$) from 22 to 34 (g DM/min) and from 3 to 7 (kg/bout) during the dawn and dusk grazing bouts, respectively. Therefore, it could be concluded that the main behavioral strategies dairy cows employ to satisfy their nutritional needs under continuous stocking include manipulating

388 The feeding of dietary phosphorus on dairy farms in the Lake Champlain Basin. K. W. Cotanch*¹, C. S. Ballard¹, W. C. Emerich¹, C. J. Sniffen², and E. D. Thomas¹, ¹W.H. Miner Agricultural Research Institute, Chazy, NY, ²Fencrest LLC, Holderness, NH.

Nutrient balance on dairy farms is critical in efforts to maintain and improve water quality in the Lake Champlain Basin. Reducing dietary phosphorus (P) levels to dairy cattle will reduce phosphorus loading of cropland from manure application. A survey of feed consultants operating in Vermont showed recommended P levels for cows producing 30 kg/d varied: 0.48 to 0.55% from five feed company consultants; 0.44% from an independent consultant; and 0.37% from the University of Vermont nutritionist. At current feeding rates, P is being fed in excess of requirements (0.32 to 0.38%). The objective of the study was to obtain baseline information about current P feeding practices on farms; farmers understanding of the nutritional requirements for P; and their attitudes about the economic and environmental importance of P reduction on dairy farms in the region. Thirty farms located in the Champlain Basin were randomly selected with weight given to farm size and facility design. Farms varied in size (100-1000 cows), facility structures and management styles from both New York and Vermont (15 per state). A 10 question survey indicated that farmers were agreeable to reducing dietary phosphorus levels, but not fully aware of the new NRC 2001 P recommendations. Only 50% of the producers claimed to know the level of P they were currently feeding. Nutritionists dietary P formulations were compared with wet chemistry analyses of diets. Only 21% of diets formulated for lactating cows were balanced for <0.40% P with ranges from 0.36-0.50%. Analyzed TMRs found that 38% of rations were <0.40% P, ranging from 0.28-0.57%. The wide variation between P levels balanced for and that actually being fed may be attributed to imprecise measurements of P in forages on the farm and feeds sold to the farm. Grain components used to manufacture feeds vary greatly in P levels and may not be accurately accounted for in ration formulation. Farm size was a critical factor in the frequency of forage testing and overall nutrient management. Larger farms had forages analyzed more than twice as often as smaller farms and were more positive to the economic savings of reducing dietary P levels.

Key Words: Phosphorus, Nutrient Management, Dairy Cattle

their eating time, biting rate and chewing rate, with little control over TGJM rate and BM.

Key Words: Grazing Behavior, Intake Rate, Bite Mass

390 Modeling pasture-based split-calving dairy systems using a whole farm model. P. C. Beukes*¹, B. S. Thorrold¹, M. E. Wastney¹, C. C. Palliser¹, J. A. S. Lancaster¹, C. F. Folkers¹, G. L. Levy¹, M. Neal^{2,1}, and M. J. Auld³, ¹Dexcel Ltd., Hamilton, New Zealand, ²University of Sydney, Sydney, Australia, ³Department of Primary Industries, Ellinbank, Australia.

Traditional New Zealand dairy systems are based on spring calving with drying off in autumn to match cow demand with pasture growth. Split-calving involves a proportion of the herd calving out-of-season (e.g. in autumn) with the aims of coping better with dry summers, reducing wastage in cows which fail to get in calf on a 12-month cycle and to benefit from a winter milk premium. A farm systems modeling approach was used to investigate feed flow and economic impacts of split calving. The first step was to calibrate the predicted lactation curves of a computer model (the Whole Farm Model; WFM) against observed data from a trial where different herds were calved in winter, spring, summer and autumn over a three-year period. Introducing a photoperiod effect on lactation hormone levels into the cow component of the model (known as "Molly"), significantly ($P < 0.01$) reduced the average prediction error for milk yields (before adjustment = 4.52, SD 1.598 kg; after adjustment = 2.77, SD 0.749 kg). The WFM was then used to compare milk fat and protein (milksolids; MS) production, silage conservation and feeding and economics (in NZ\$) between a spring-calving (July) system and a 50:50 spring-autumn (May) split-calving system over five different climate years (1998-2002). At a similar stocking rate the split-calving herd produced 9.4 kg MS/cow and 28.8 kg MS/ha more ($P < 0.001$) than the spring-calving herd, but with no significant difference in silage