

high moisture content (60 to 75%) and presence of organic acids poses a challenge to use it as a food ingredient without further processing. Researchers have studied the thermodynamics of moisture migration in DLP. Greek yogurt whey is compositionally different from cheese whey and, thus, poses economic and environmental challenges to the dairy industry. Greek style yogurt in the United States is one of the largest growing sectors in the dairy industry. Greek yogurt is produced by removing a part of water and water-soluble components from yogurt. Consequently, a large quantity of Greek yogurt whey (GYW) is being produced as a co-product. The objective of the present work was to present a review of newer knowledge on the manufacture and utilization of dairy co-products. It includes evaluations of the use of magnetic fluid treatment (MFT) and addition of clay minerals as alternative methods for separating valuable DLP and GYW components.

**Key Words:** demineralization, delactosed permeate, Greek yogurt whey

---

#### 0577 **Advancements in drying lactose and acid whey.**

J. G. Ronckers\*, *Relco, Willmar, MN.*

Aspects involved in the drying of whey and its lactose containing co-products will be highlighted, including lactose crystallization and its influences on lactose crystallization rates and drying efficiency. Glass transition, thermo plasticity, and the sticky line will be defined and discussed in relation to post crystallization in the dryer. Challenges with the Maillard reactions (nonenzymatic browning) and caking of the powder will be discussed. Drying of crystallized lactose, for instance, and the application of the "CrystaLac," a lactose crystallizing evaporator that helps increase yields, will be discussed. Methods of crystal separation and refining will be covered. Details will be shared about how lactose drying is conducted in 2 stages, using a primary attrition dryer with built in powder moisture and size classifier and a secondary stage for after drying and cooling with a fluid bed. Drying of permeate and sweet whey will be covered, including the "HiCon," a high concentration evaporator, the "CCC" Cooling, Concentration, and Crystallizing unit, and the dryer. The influences of lactose crystal sizes on drying efficiency will be covered. Finally, challenges of drying acid whey will be discussed. We will also discuss the crystallization of lactose and sticky components in acid whey and the challenges that we face when drying acid whey. The history of drying acid whey will be summarized. Future possible solutions will be proposed, such as increased crystallization by higher solids, small crystal sizes, membranes to filter out sticky components, humidity control of dryer exhaust air to prevent sticky powder, and the use of a desiccator for decreasing and controlling drying air humidity to be able to dry at lower temperatures.

**Key Words:** lactose, whey, crystallization, drying, co-products

---

#### 0578 **Lactose derivatives and GOS as prebiotic fibers.**

T. C. Schoenfuß\*, *University of Minnesota, Department of Food Science and Nutrition, St. Paul.*

Lactose is a disaccharide in dairy ingredients and co-products that can be polymerized by both chemical and enzymatic reactions into soluble dietary fiber. Products of each of these manufacturing processes can also be prebiotics if they have demonstrated benefits such as the positive modulation of gut microbiota and improvements in other indicators of digestive health. The enzymatic reaction involves incubating the enzyme  $\beta$ -galactosidase with lactose under specific concentration and temperature conditions to favor the polymerization reaction over hydrolysis. The polymerized product of this reaction is called galactooligosaccharides (GOS). The source of the  $\beta$ -galactosidase enzyme greatly affects the temperature requirements for polymerization, the products of the reaction (the amounts of branching and degree of polymerization), and temperature stability of the enzyme. Polymerization of lactose can also be achieved through reacting acid with lactose during heating. This can be achieved under vacuum or pressure during heating either in batch or continuous processes. The degree of polymerization and branching can vary greatly depending on the reaction conditions. The products of this reaction are called poly lactose. This seminar will provide an overview of the production of both types of products and an evaluation of these fibers for prebiotic activity.

**Key Words:** fiber, polymerization, GOS

---

### EXTENSION EDUCATION

---

#### 0579 **S survey of serum trace mineral concentrations in weaned Montana ram lambs.**

C. M. Page<sup>\*1</sup>, M. Van Emon<sup>1</sup>, S. Spear<sup>1</sup>, T. W. Murphy<sup>2</sup>, J. G. P. Bowman<sup>1</sup>, and W. C. Stewart<sup>1</sup>, <sup>1</sup>Montana State University, Bozeman, <sup>2</sup>University of Wisconsin-Madison, Department of Animal Sciences, Madison.

Clinical and subclinical trace mineral deficiencies can limit productivity in western sheep production systems. The objective of the study was to quantify trace mineral status among Montana ram lambs post weaning. Based on prior research investigating forage trace mineral concentrations and trace mineral status in cattle, we hypothesized that clinical and subclinical deficiencies would be most prominent with Zn and Se. To test this hypothesis, serum samples ( $n = 201$ ) were collected from ram lambs 8 to 10 mo of age (BW  $52.8 \pm 16$  kg) at 21 locations throughout Montana and analyzed for Co, Cu, Fe, Mn, Mo, Se, and Zn. The average concentration and range for each trace mineral analyzed in the serum samples were Co ( $1.00 \pm 0.079$  ng/mL, 0.09–6.22 ng/mL), Cu ( $0.84 \pm 0.016$   $\mu$ g/mL, 0.3–1.61  $\mu$ g/mL), Fe ( $154.85 \pm 3.682$   $\mu$ g/dL, 26–350  $\mu$ g/

dL), Mn ( $2.56 \pm 0.225$  ng/mL, 0.7–31.3 ng/mL), Mo ( $40.14 \pm 5.001$  ng/mL, 2.8–456.5 ng/mL), Se ( $111.42 \pm 3.31$  ng/mL, 16–197 ng/mL), and Zn ( $0.73 \pm 0.015$  µg/mL, 0.3–1.74 µg/mL). The two most deficient and marginally deficient minerals across Montana were Se (19% of ranches deficient and 24% of ranches marginally deficient) and Zn (14% of ranches deficient and 52% of ranches marginally deficient). All Se deficient samples were obtained from western Montana. There was considerable variation in serum trace mineral concentrations within individual flocks. Descriptive statistics were analyzed using SAS. Given that Se and Zn play major roles in growth, fertility, and immunity, results suggest opportunities for more effective supplementation strategies. Producers and nutritionists alike can use these results to identify mineral deficient areas and develop cost effective mineral supplementation management practices.

**Key Words:** trace minerals, zinc, selenium, Montana, sheep, ram lambs

---

**0580 Breakfast on the farm event is an effective learning activity and improves consumer perceptions of dairy production.** J. M. Smith<sup>\*1</sup>, and T. A. Ferris<sup>2</sup>, <sup>1</sup>University of Vermont, Burlington, <sup>2</sup>Michigan State University, East Lansing.

Educational farm tours, such as Breakfast on the Farm, provide the public an opportunity to learn firsthand, ask questions of farmers and other professionals, and give feedback about modern food production. Vermont held its first Breakfast on the Farm event on a dairy farm in August 2015. Patterned after the Breakfast on the Farm events in Michigan, the event was designed to educate consumers on key areas of concern: animal care, environmental protection, and food safety. Educational stations, coordinated by UVM Extension, were placed along a walking tour of the farm facilities allowing visitors to see cow and calf housing, milking facilities, and how feed is produced and fed. An exit survey instrument consisting of pre-post questions evaluated what participants learned and their change in perceptions of several agricultural practices. Of 550 visitors, 227 who were at least 18 yr old completed the questionnaire. Almost half of respondents had visited a working dairy farm fewer than 3 times before this event. On a 5-point scale from very little to very much, respondents indicated how much was learned about how cows are housed (4.08), what cows eat (3.91), how cows receive health care (3.38), how antibiotics are kept out of the food supply (2.87), how technology is used in dairy production (4.33), how farmers protect water quality (3.34), how calves are cared for (3.76), and how crops are grown and stored (3.60). First-time visitors gained the greatest knowledge about how technology is being used and how cows are being housed. On a 5-point scale where 1 is strongly disagree and 5 is strongly agree, first-time visitors had an average score increase of 0.56 between their before and after tour ratings of their agreement with statements that dairy farmers

are treating animals humanely, protecting water quality, using pesticides responsibly, and using antibiotics responsibly. The greatest change in beliefs was about dairy farmers treating animals humanely with a mean increase of 0.74 and 0.51, respectively, among first-time visitors and all respondents. The percentage of first-time visitors agreeing or strongly agreeing that farmers treat animals humanely increased from 61% to 91% after touring the farm. Before and after differences were significant at  $P < 0.005$  (paired  $t$  test) for all questions. This event improved consumer knowledge and impressions about modern dairy farms and management practices.

**Key Words:** educational farm tour, consumer perception, modern dairy production

---

**0581 Breakfast on the farm, an educational farm tour, improves consumer trust in animal care, food safety, and modern conventional dairy production.** T. A. Ferris<sup>\*1</sup>, J. M. Smith<sup>2</sup>, E. M. Richer<sup>3</sup>, M. Welker<sup>3</sup>, J. Stechschulte<sup>3</sup>, M. A. Dunckel<sup>4</sup>, and A. E. Kuschel<sup>5</sup>, <sup>1</sup>Michigan State University, East Lansing, <sup>2</sup>University of Vermont, Burlington, <sup>3</sup>Ohio State University Extension, Wauseon, <sup>4</sup>Michigan State University Extension, Alpena, <sup>5</sup>Michigan State University Extension, Clinton Twp.

In 2015, five Breakfast on the Farm (BOTF) educational dairy tours were held in Michigan (MI) with 12,068 participants, one in Ohio (OH) with 3009 participants, and one in Vermont (VT) with 550 participants. Exit surveys were collected from 1406, 578, and 220 participants from MI, OH, and VT, respectively, to determine the impact of educational farm tours on consumer trust in animal care, food safety, and modern food production. Thirty-seven, 60, and 25% of participants from MI, OH, and VT, respectively, had not visited a working dairy farm in the past 20 yr (first-time visitors). Upon exiting the tour, participants were asked about their level of trust on topics “before” and “after” the tour on a 5-point scale from 1 being very low to 5 being very high trust. The mean ( $\pm$  SD) for before, after, and change (after–before) for first-time visitors’ level of trust in modern food production were, respectively, 3.60 ( $\pm$  1.14), 4.50 ( $\pm$  0.75), and 0.90 ( $\pm$  0.94) for MI; 3.68 ( $\pm$  1.13), 4.44 ( $\pm$  0.89), and 0.76 ( $\pm$  0.86) for OH; and 3.96 ( $\pm$  1.02), 4.59 ( $\pm$  0.80), and 0.63 ( $\pm$  0.89) for VT. First-time visitors’ level of trust that dairy farmers will do the right thing in caring for food-producing animals for before, after, and change, respectively, were 3.94 ( $\pm$  1.07), 4.69 ( $\pm$  0.59), and 0.75 ( $\pm$  0.93) for MI; 4.00 ( $\pm$  1.04), 4.64 ( $\pm$  0.68), and 0.64 ( $\pm$  0.89) for OH; and 3.88 ( $\pm$  1.03), 4.57 ( $\pm$  0.73), and 0.69 ( $\pm$  0.88) for VT. First-time visitors’ level of trust that dairy farmers will do the right thing to safe-guard milk for before, after, and change, respectively, were 4.02 ( $\pm$  1.03), 4.75 ( $\pm$  0.53), and 0.73 ( $\pm$  0.95) for MI; 4.11 ( $\pm$  1.01), 4.71 ( $\pm$  0.58), and 0.60 ( $\pm$  0.91) for OH; and 4.24 ( $\pm$  0.82), 4.73 ( $\pm$  0.53), and 0.49 ( $\pm$  0.64) for VT. All mean increases (after–before)

were significant at  $P < 0.005$  using a paired- $t$  test. Forty-five, 44, and 41% of MI, OH, and VT participants, respectively, rated farmers' efforts to prevent milk from cows treated with antibiotics from being sold to the consumer as a major factor for increasing their trust, and 42, 44, and 65% of MI, OH, and VT participants, respectively, rated their comfort with how animals are housed and managed as a major factor. Exit surveys show educational farm tours increase the level of trust consumers have for animal care and housing, food safety, and modern dairy farms.

**Key Words:** educational farm tours, consumer trust, modern food production

---

**0582 Creation, delivery, and assessment of the livestock education and certification for agricultural law enforcement extension program.** C. Wickens\*<sup>1</sup>, M. J. Hersom<sup>2</sup>, R. G. Easterly III<sup>1</sup>, E. Jennings<sup>1</sup>, B. Myers<sup>1</sup>, J. Shuffitt<sup>1</sup>, B. Stice<sup>1</sup>, and J. Weir<sup>1</sup>, <sup>1</sup>University of Florida, Gainesville, <sup>2</sup>Department of Animal Sciences, University of Florida, Gainesville.

Many law enforcement and government agencies have dedicated law enforcement officers (LEOs) who respond to agricultural crime, agricultural inspection, urban/rural interface issues, and potential livestock neglect cases. These LEOs are potential Extension clients with educational needs. We partnered with Farm Bureau and Florida Department of Agriculture and Consumer Services to develop and implement a training and certification program for Florida LEOs in the field of animal science. The accompanying certification program adds credibility to this clientele group when they present testimony in court and make difficult decisions in cases. Using backward design methodology, a curriculum relevant to the needs of LEOs was developed and delivered by subject matter experts. A pilot program was delivered to a group of veteran LEOs in July 2014. Survey and focus group data obtained from pilot participants were used to modify program content. Three classes were offered to 52 individuals in March and December 2015 and in March 2016. Instruction used a combination of classroom and experiential learning sessions utilizing applicable equipment and live animals. Daily homework assignments and quizzes were administered to enhance retention. Final assessment to achieve certification included six hands-on exercises to demonstrate proficiency and a written, multiple-choice examination. Statistical analysis of survey data was performed using the UNIVARIATE procedure in SAS (v9.2). 94% of the participants passed the certification requirements of the program, and overall subject matter knowledge increased by 36%. Likert scale responses (1 = very little, 2 = little, 3 = some, 4 = much, 5 = very much) regarding knowledge of 14 subject matter topics before ( $2.89 \pm 0.11$ ) and after ( $3.83 \pm 0.07$ ) indicated a mean increase of  $0.91 \pm 0.09$  units. Subject matter knowledge with a  $> 1$  unit increase included cattle ( $1.40 \pm 0.15$ ) and equine ( $1.43 \pm 0.14$ ) body

condition scoring, equine behavior ( $1.00 \pm 0.15$ ) and learning lab ( $1.07 \pm 0.12$ ), and animal nutrition ( $1.13 \pm 0.11$ ). Likert scale responses (1 strongly disagree, 2 disagree, 3 neutral, 4 agree, 5 strongly agree) indicated the usefulness of information to participants when working in the field ( $4.20 \pm 0.10$ ), whether participants feel better prepared to respond ( $4.20 \pm 0.08$ ), and whether instructors presented the material clearly ( $4.34 \pm 0.07$ ). The LECAL program addresses specific core curriculum to improve LEOs knowledge and skills. Utilization of the LECAL program by Florida LEOs could result in a savings of nearly \$2,500 per client compared to other national certifying services.

**Key Words:** law enforcement, livestock, training

---

**0583 Benchmark demographics of the Mississippi feeder calf board sale program.** E. A. Caldwell\*<sup>1</sup>, B. B. Karisch<sup>1</sup>, J. M. Riley<sup>2</sup>, and J. A. Parish<sup>3</sup>, <sup>1</sup>Mississippi State University, Mississippi State, <sup>2</sup>Oklahoma State University, Stillwater, <sup>3</sup>Mississippi State University, Prairie.

The semi-annual Mississippi feeder calf board sale program serves as an opportunity for beef cattle producers to build a more successful marketing strategy in the feeder cattle sector. The board sales encourage more uniform load-lots in addition to reduced shrink, handling, and comingling before shipping due to the off-site marketing of calves. Established in 2008, the program has recorded 309 total lots sold consisting of nearly 25,000 heads of cattle, with the receipts from these sales exceeding \$19 million. To examine benchmark values of the board sale program, lot demographics of each sale were analyzed using the Proc Means procedure of SAS. Frequencies of hide color characteristics reveal that 92.6% of all lots sold advertised some percentage of black-hided cattle, followed by 47.2% of lots with smoke color, 43% with red, and 18.1% with white color. Specifically, 64% of all lots consisted of at least 75% black cattle, 36.6% of lots contained less than 25% red cattle, and 34% contained less than 25% cattle with smoke hide color. Lots marketed with Brahman influence represent 14.2% of lots sold. The mean weighted average lot body weight per calf across all years was  $315.3 \pm 4.4$  kg. Results show that 0.3% of lots had a weighted average body weight per calf of less than 226.8 kg, 5.9% weighed 226.8 to 271.2 kg, 47.6% weighed 272.2 to 317.1 kg, 30.6% weighed 317.5 to 362.4 kg, 15.3% weighed 362.9 to 407.8 kg, and 0.3% weighed more than 408.2 kg. Mixed gender lots comprised 45.3% of all lots sold, followed by steer-only lots at 33.7% and heifer-only lots at 21%. Use of growth-promoting implants was advertised for 12.6% of total lots, whereas 20.4% of lots marketed cattle produced without growth promotants. Participation results indicate fewer lots per sale since 2008 accompanied by a slight increase in number of heads per sale due to increased number of heads per lot sold. Furthermore, price trends of the board sale program indicate a steady increase in selling price

throughout its history. In summary, the Mississippi feeder calf board sale program continues to provide producers a viable alternative marketing strategy. The specific attributes of each lot are central to its selling value, as consistent and industry-recognizable lot characteristics may bring premiums at sale.

**Key Words:** board sale, feeder calf, marketing

---

**0584 The show-me-select replacement heifer program: adding value to beef herds in Missouri.**

J. W. C. Locke\*, J. M. Thomas, B. E. Bishop, J. M. Abel, S. E. Pook, D. S. Brown, J. E. Decker, and D. J. Patterson, *University of Missouri, Columbia.*

The Missouri Show-Me-Select Replacement Heifer Program was designed to improve reproductive efficiency of beef herds in Missouri and increase individual farm income. During the past 18 yr, 822 farms enrolled 122,970 heifers in the program. Regional extension livestock specialists work closely with the 243 veterinarians involved with the program state wide. State specialists provide program support to regional extension field staff and participating veterinarians. The marketing component of the program facilitated the sale of 30,539 heifers in 141 sales from 1997 through sales in 2015. These sales generated interest from 9484 prospective buyers that formally registered to buy heifers and 3366 individuals that purchased heifers from the various sales. Heifers from the program have now sold to farms in 19 states. Collectively, 141 sales have generated \$42,984,650 in gross sales. A Tier Two classification was created recently that distinguishes heifers from genetically superior high accuracy sires. Using data from the Fall 2015 sales, in which Tier Two heifers sold, we may consider opportunities for producers to add value to their heifers as a result of improvements in genetic merit. Using the average sales price of Show-Me-Select qualified heifers carrying a natural-service sired pregnancy as a baseline sale average, we can make the following comparisons to determine the relative added value that resulted from improvements in genetics of the heifer and/or the pregnancy the heifer was carrying: Show-Me-Select heifers carrying natural-service sired pregnancies sold for an average sale price per heifer of \$2,242; Show-Me-Select heifers carrying AI-sired pregnancies sold for an average sale price per heifer of \$2,437, adding \$195 per heifer; Tier Two Show-Me-Select heifers carrying natural-service sired pregnancies sold for an average sale price per heifer of \$2,371, adding \$129 per heifer; and Tier Two Show-Me-Select heifers carrying AI-sired pregnancies sold for an average sale price per heifer of \$2,664, adding \$422 per heifer. The Missouri Show-Me-Select Replacement Heifer Program is the first statewide on-farm beef heifer development and marketing program of its kind in the U.S. Impact on Missouri's economy that resulted from the past 18 yr of the

Show-Me-Select program now exceeds \$110M.

**Key Words:** added value, beef heifer, extension program

---

**0585 Perceived mastitis costs and milk quality management practices among Southeastern United States dairy producers.** D. T. Nolan<sup>\*1</sup>,

C. Blakely<sup>2</sup>, P. D. Krawczel<sup>2</sup>, C. S. Petersson-Wolfe<sup>3</sup>, G. M. Pighetti<sup>2</sup>, A. Stone<sup>1</sup>, S. Ward<sup>4</sup>, and J. M. Bewley<sup>1</sup>, <sup>1</sup>*University of Kentucky, Lexington,* <sup>2</sup>*University of Tennessee, Knoxville,* <sup>3</sup>*Virginia Tech University, Blacksburg,* <sup>4</sup>*Mississippi State University, Mississippi State.*

Researchers from four universities in the southeastern United States completed 175-question surveys on 282 farms in TN ( $n = 83$ ), KY ( $n = 96$ ), VA ( $n = 96$ ), and MS ( $n = 7$ ) from June 22, 2014 to June 21, 2015 as a part of the Southeast Quality Milk Initiative project. The objective of this study was to analyze questions focusing on the costs associated with milk quality management and to quantify dairy producer estimates of mastitis costs. The MEANS procedure in SAS 9.3 (SAS Institute, Cary, NC) was used to summarize costs of pre- and post-milking teat disinfectants, intramammary antibiotics for mastitis treatment, vaccinations, and producer estimates of subclinical and clinical mastitis costs. The average costs associated with specific management practices and producer estimates of mastitis costs are presented in Table 1. One hundred twenty-four and 126 producers provided enough information to allow the researchers to calculate the costs of pre- and post-milking teat disinfectants per cow per day, respectively. Two hundred seventeen producers provided the researchers enough information to determine the cost of intramammary antibiotics per mastitis case. Only 52 and 3 producers provided enough information to calculate the costs of environmental and contagious mastitis vaccines per cow, respectively. When estimating the cost of clinical and subclinical mastitis, 241 and 208 producers provided a numerical estimate, respectively. Remaining producers either did not know or did not provide an estimate. These results provide new insights into producer perception of mastitis and milk quality economics.

**Key Words:** costs, mastitis, milk quality, SQMI

---

**0586 Development of a web-based calendar tool for scheduling beef cow management activities.**

D. Poddaturi<sup>1</sup>, S. Johnson<sup>\*2</sup>, G. R. Dahlke<sup>1</sup>, D. A. Blasi<sup>3</sup>, and G. Hanzlicek<sup>4</sup>, <sup>1</sup>*Iowa State University, Ames,* <sup>2</sup>*Kansas State University, Colby,* <sup>3</sup>*Department of Animal Science and Industry, Kansas State University, Manhattan,* <sup>4</sup>*Kansas State Veterinary Diagnostic Laboratory, Manhattan.*

Extension efforts often remind producers of timely management practices and their value. Recommendations must

revolve around presumed average time of activities, such as calving and weaning. The objective of the current project was to develop a web-based cow/calf management tool to create a customizable yearly production calendar. The Management Minder (MM) was designed for beef cattle producers to facilitate the timely implementation of routine management steps to optimize health, nutrition, reproduction, and general management. The MM helps beef producers schedule routine activities based on default intervals from the appropriate date category (calving/breeding, weaning, grass turnout, and receiving cattle), and communicate these events to other members of the management team. An automatic portion adds all of the activities in a particular category and a check box is used to eliminate those not needed. Activities can also be added one at a time in a manual build portion. The program emails an ics file of user selections that can be imported by OUTLOOK™, GOOGLE™, and YAHOO™ calendar systems. Thus automatic reminders are put in place so that adequate time is allowed for cow weight gain in the third trimester, AI breeding programs can be planned, or all needed supplies can be obtained in advance of processing days. Users register on the website <http://cowweb.exnet.iastate.edu/Cow-Web/faces/> with a unique farm/ranch name. The application provides an option to register multiple users under the same operation. Other family/team members, consultants, or veterinarians can be given access to add events to the same farm/ranch calendar. Veterinarians can set up health programs in a calendar form for individual clients. The calendar showing the upcoming activities can be used for planning and to improve communication among team members. A dynamic database stores events for each particular farm/ranch so they can be automatically advanced to the next year, minimizing the time needed for set-up in subsequent years. Supporting information or references regarding best management practices for the selected activities are provided as web links and can be easily updated. Since the program was first made available in January 2016, user suggestions have been incorporated to improve the tool. The concept is applicable to many areas of plant and animal management that function in biological and environmental cycles. Users of this free tool have the opportunity to improve the timeliness of management activities, improve communication with partners, and reduce costs associated with forgotten or delayed management.

**Key Words:** calendar, cow/calf, extension

---

**0587 Comparing the Penn State and NRC 2001 heifer ration programs.** L. K. Mitchell\*, and A. J. Heinrichs, *Pennsylvania State University, University Park.*

Formulating dairy heifer rations is an often overlooked aspect of farm feeding programs. The Penn State dairy heifer diet formulator (PSU-HDF) was originally developed to design and evaluate diets used in heifer research. The current objective

was to evaluate differences between the PSU-HDF and the 2001 NRC program. Drawing from fundamental heifer studies at Penn State, the basis for diet formulation in PSU-HDF is N intake (g/kg of metabolic body weight) with a target of 1.67 g of N/kg BW<sup>0.75</sup>. In contrast, the NRC emphasizes the intake of crude protein (CP) and its fractions. Furthermore, the NRC recommends dairy heifer diets to meet certain dry matter intakes (DMI) in addition to meeting metabolizable energy (ME) requirements. Research at Penn State has demonstrated that varying DMI can produce similar average daily gains (ADG) provided the diet precisely meets the ME requirements. Therefore, PSU-HDF places more emphasis on meeting ME needs and adjusts DMI as necessary. For a heifer at 6 mo weighing 200 kg targeting an ADG of 800 g, the NRC recommends a diet with 14.2% CP, 11.9 Mcal/d ME, and 5.2 kg/d DMI. Using PSU-HDF, the same heifer had her needs met by a diet with 13.6% CP, 11.7 Mcal/d ME, and 4.3 kg/d DMI. A heifer at 14 mo weighing 400 kg targeting an ADG of 800 g was recommended by the NRC to receive a diet with 11.3% CP, 20.1 Mcal/d ME, and 8.8 kg/d DMI. The diet for the same heifer using PSU-HDF was 13.1% CP, 19.7 Mcal/d ME, and 7.1 kg/d DMI. Comparing the output of these two models, we find that the NRC model often predicts 20% more DMI and 60 to 155 more g CP intake. The NRC recommends 0.2238, 0.2247, and 0.2247 Mcal/kg BW<sup>0.75</sup> of ME for heifers at 200, 300, and 400 kg, respectively, when targeting an ADG of 800 g. These values are consistently higher than PSU-HDF recommendations of 0.2199, 0.22, and 0.22 Mcal/kg BW<sup>0.75</sup> of ME for heifers with the same parameters. These results show consistent overestimation of nutrient requirements by the NRC program. According to our research trials using precision and ad libitum formulation, the PSU-HDF model will allow nutritionists to formulate diets to meet dairy heifer needs and reduce feed cost by feeding less protein and dry matter.

**Key Words:** dairy heifer, diet formulation

---

**0588 Motivations of calf care workers for sick calf identification and treatment decisions.** C. Crudo<sup>1</sup>, D. A. Moore<sup>2</sup>, J. A. Afema<sup>1</sup>, and W. M. Sischo<sup>1</sup>, <sup>1</sup>Washington State University, Pullman, <sup>2</sup>Department of Veterinary Clinical Sciences, Washington State University, Pullman, WA.

On large dairy farm operations and calf rearing facilities, identification and treatment of sick pre-weaned calves is in the hands of employees. Understanding the motivation behind why and how calf care workers make treatment decisions could help Extension educators and dairy advisors create more tailored messages about judicious antimicrobial use. The purpose of this project was to better understand decision making on these operations by assessing employee motivation using a standardized survey tool. Western United States dairy farms and calf ranches with > 200 pre-weaned calves were contacted through their veterinarian to participate in the study. A sample

Table 0585.

**Table 1: Average cost estimates among dairy producers for mastitis control practices and perceived costs of mastitis cases.**

	Mean	Standard Deviation	Median
Pre-dip cost/cow/d	\$0.04	\$0.04	\$0.03
Post-dip cost /cow/d	\$0.06	\$0.05	\$0.04
Intramammary antibiotic cost/mastitis case	\$14.85	\$10.84	\$12.67
Environmental vaccine cost/cow/lactation	\$3.43	\$4.60	\$3.00
Contagious vaccine cost/cow/lactation	\$3.30	\$1.98	\$3.60
Cost estimate of clinical mastitis <sup>1</sup>	\$288.00	\$520.25	\$175.00
Cost estimate of subclinical mastitis <sup>2</sup>	\$301.00	\$746.83	\$150.00

<sup>1</sup>Cost estimate made by producer for a clinical case of mastitis

<sup>2</sup>Cost estimate made by producer for a subclinical case of mastitis

size of 96 individuals was estimated based on a prevalence of 0.5 for the dominant motivation type with a precision of 0.1 and 95% confidence. The survey tool was adapted from the Motivations Sources Inventory and included 10 questions on motivation for specific aspects of calf care with response categories referring to the five motivation types: 1. External, motivated by recognition from supervisor or coworkers; 2. Extrinsic, motivated by bonuses or other monetary means; 3. Intrinsic, motivated by one's belief system; 4. Internal, motivated by task enjoyment; and 5. Goal Internal, motivated by a desire to meet the organization's goals. Additional questions included job title, training, communication, and information seeking. One-hundred seven individuals from 28 farms participated in the personal interviews. Most were calf feeders (47%), who had worked in that position for more than 5 yr. The most common motivation type was Intrinsic (41 ± 12%), and there were none of the Extrinsic type (0%). The majority of farms (79%) had calf care workers of a variety of motivation types. Six farms had employees of all the same type. Calf Feeders were predominantly Goal Internal (36 ± 13%). Calf managers and calf treaters were predominantly Intrinsic (40 ± 18% and 44 ± 23%). The dominant motivation type for sick calf identification questions was Intrinsic (32 to 50%). The dominant motivation type for questions dealing with calf treatment was Goal Internal (37 to 51%). There is a great deal of variation in calf care worker motivation types, but overall, messages and training programs to address prudent antimicrobial use could benefit by addressing belief systems for sick calf identification and the reinforcement of goals and protocols when addressing treatment.

**Key Words:** calf care, motivation, treatment

### 0589 Developing a feed allocation model to maximize income over feed cost considering farmer risk preferences.

D. Liang\*, T. F. Rutherford,  
B. L. Jones, R. D. Shaver, and V. Cabrera,  
*University of Wisconsin-Madison, Madison.*

We developed a nonlinear programming model that selects the optimal cropping plan and diet formulation to maximize farm income over feed cost (IOFC) in a representative 200-lactating cow, 100-ha south-central Wisconsin farm. Nutrition

requirements for 6 cow-groups were formulated according to National Research Council equations. Then, the model selected the group production level toward maximum IOFC, which included milk and surplus feed sale, feed production cost, and feed purchasing cost. Yearly farm-produced feed, forage quality (NDF), and feed production costs were simulated with the integrated farm system model (IFSM, USDA, 2014) using 25-yr daily weather data (1986 to 2010). Farm-produced forage was priced according to its quality. The farm could purchase feed and sell surplus feed at 90% of market price. Feed prices were collected from the Understanding Dairy Market website (<http://future.aae.wisc.edu>) or predicted using FeedVal v6.0 (<http://DairyMGT.info>). Purchased feed and milk prices reflected 2015 market conditions, and cost of feed production was calculated aggregating resource inputs according to weather year. The optimal solution maximized the total IOFC across 25 weather years, considering the influences of farmer risk preferences toward decision-making through expected utility theory. Hence, the model also proposed an optimal cropping plan to maximize IOFC. Average IOFC across 25 yr was \$8.07/cow per d with the original cropping plan of 57.1 ha of corn and 42.9 ha of alfalfa. The model chose to lower milk production for higher IOFC in some years. The farm's IOFC increased with higher milk production and varied from year-to-year because of crop yield and quality. The difference between the highest and lowest yearly IOFC was 27% on low milk production farms (5 kg per cow per d below Wisconsin average) and decreased to 17% on high milk production farms (5 kg per cow per d above Wisconsin average). Diet formulation and purchasing strategies changed for each weather year to maximize IOFC according to farm-grown feed quantity and quality. Results showed that planting corn and harvesting corn silage were favored. The model would choose to plant alfalfa only if alfalfa production cost was decreased by 8% or corn production cost was increased by 6%. A farmer with higher risk tolerance would prefer to purchase more feed from outside than a farmer with less risk tolerance.

**Key Words:** income over feed cost, feed allocation, whole-farm optimization

---

**0590 A qualitative assessment of perception and communication barriers that interfere with the transfer of knowledge to dairy farmers.**

M. E. Woolpert<sup>1,2</sup>, C. E. Morse<sup>1</sup>, and D. M. Barbano<sup>3</sup>,  
<sup>1</sup>University of Vermont, Burlington, <sup>2</sup>William H. Miner Agricultural Research Institute, Chazy, NY,  
<sup>3</sup>Cornell University, Department of Food Science, Northeast Dairy Foods Research Center, Ithaca, NY.

Efficient sharing of knowledge between consultants and dairy farmers is critically important to the success of the dairy industry. Awareness of how and where dairy farmers seek expert information when making farm management decisions is essential to understanding the communication network of scientists, agricultural experts, and farmers. This study investigated dairy farmer decision-making and communication networks as part of a larger research project on the relationships between farm management practices and milk fat and protein production on dairy farms in the Northeastern United States. Communication networks and barriers to successful information transfer were described by a subset of the farmers enrolled in the larger study. As managing a dairy farm involves complex decision-making processes across diverse knowledge areas, it was hypothesized that dairy farmers seek information from many sources and that barriers exist that are specific to the source and type of information. This research is framed within the “communication for innovation theory,” which acknowledges that a person’s experiences influence how he/she perceives and reacts to new information and that information transfer frequently encounters obstacles. Semistructured interviews were conducted with a heterogeneous subsample of farmers ( $n = 9$ ) to collect detailed, diverse, and in-depth perspectives and experiences on decision-making and information transfer. To investigate the cooperative’s role in information transfer, additional interviews were conducted with two cooperative employees. Interviews were audio-recorded, transcribed, and coded to identify common themes expressed by farmers or cooperative employees. Farmers identified the cooperative (which communicates via the internet and field technicians), expert consultants (nutritionist, veterinarian, and agronomists), financial advisors, print publications, and other farmers as principal sources of information. However, barriers to the transfer of information include farm management and family dynamics, lack of access to high speed internet, and difficulties evaluating divergent recommendations from experts. Several farmers expressed an incorrect perception of their farms’ fat and protein production compared with cooperative averages, which reduced their motivation to incorporate management changes. Recommendations to overcoming these barriers were suggested by interview participants and include integrating management team meetings and facilitating informal discussion groups between farmers. Knowledge about improving milk fat and protein does not easily find its way to individual dairy farmers due to barriers within their

communication network, and the proposed recommendations may aid in overcoming these barriers.

**Key Words:** decision making, extension education, information networks

---

**EXTENSION EDUCATION SYMPOSIUM:  
GROWING EXTENSION’S IMPACTS WITH  
CHANGING BUDGETS AND PERSONNEL**

---

**0591 Work-life balance for extension professionals: maybe it should be redefined as ‘work-life effectiveness’.** G. P. Lardy\*, *North Dakota State University, Fargo.*

The literature is littered with articles related to work-life balance for a variety of professions. Do extension professionals experience work-life balance any differently than other professional or academic careers? Should we redefine work-life balance to instead be referred to as work-life effectiveness as some writers have proposed? Let’s start with the first question. One can make the case for both sides of this argument. The case for being different includes the situations where we expect a considerable amount of night and weekend work from extension professionals. Many have split appointments with expectations in research and/or teaching, which tends to increase the expectations of their supervisor(s). However, the case against it includes the fact that many professionals in academia and industry have careers that require travel and many have multiple job duties, similar to split appointments in academia. While there may be some differences, there are likely more similarities. Let’s evaluate the second question, should we redefine work-life balance as work-life effectiveness as some writers have proposed? In many cases, I would argue that we should be looking for work-life effectiveness rather than balance. Balance may imply some sort of notion of equal time at work and outside of work. In reality, there are likely few times when that is the case. Effectiveness, however, denotes a system or situation that produces the intended result. So, how does an extension professional (or any other professional) enhance work-life effectiveness? Here are a couple of suggestions. 1. Define what success looks like. What does being an effective extension professional look like? This should be done in concert with your supervisor. As for your personal life, perhaps asking ‘What does an effective spouse, mother, father look like?’ is an appropriate question to ask. 2. Set boundaries/maintain control. This includes various aspects of your career, including your schedule. If there are important family events that you want to be there for, be sure you get them on the calendar. Schedule time for personal time. Don’t schedule every available minute. 3. Find time to ensure that your physical, emotional, and spiritual well-being are nurtured in addition to your professional development. In summary, I believe we should be discussing this topic as work-life effectiveness rather than work-life