Speaker Summaries and Biographical Data

Keynote Speaker
Bob James, Down Home Heifer Solutions (Virginia Tech, retired)

Dr. Bob James recently retired as the dairy extension project leader in the Dept. of Dairy Science with additional responsibilities in teaching and research. He received the University Academy of Teaching Excellence Award in 2010. His research focused on management of growing calves and heifers. A Jersey milk replacer was developed based upon Virginia Tech research. Most recently his research has focused on management of on farm pasteurizers used for calf feeding and automated calf feeding systems. He is a founding member of the Dairy Calf and Heifer Association and served as the conference chairperson several times including the 2016 and 2017 conferences. Bob has made presentations and consulted with calf ranches, dairies and feed companies in over 29 U.S. states, Canada, Mexico, South America, Asia and Europe. Upon retirement, Bob established a consulting service in the area of calf and heifer management and nutrition.

Biology of Growth in Dairy Heifers
James Drackley, University of Illinois

This conference deals with dairy replacement heifers from weaning through first lactation. As such, the fundamental biological process involved is growth. All issues of management and economics revolve around the biological processes of growth and development of the animal. Growth can be defined as the general expansion of size of the animal by addition of new tissue. Growth occurs through a combination of formation of new cells (hyperplasia), increased size of existing cells (hypertrophy), or accumulation of material between or around cells (accretion).

Cattle, like other mammals, are determinate growers, meaning that they increase in size to a genetically determined mature size. This contrasts with animals such as fish that are indeterminate growers, which can keep increasing in size all their life if the environment and nutrient supply allow it. Therefore, efforts to increase growth rates in heifers do not mean that we will produce a larger cow, only that we will get the animal to a productive size more quickly and more efficiently. This in turn improves the profitability of dairy farms and heifer raisers, while also using feed resources more efficiently and decreasing wastes into the environment.

Growth begins at conception and the first stages of development and growth occur during gestation before birth. Calves are born more highly developed than many other species, including humans, and then can grow very rapidly during early life. Growth in the stages from weaning through first calving is generally described as linear, with near-constant daily gains in body weight. Bone and muscle are the organs that most increase in size, leading to “frame” or skeletal growth. Increases of bone length essentially stop at puberty because of the actions of increased estrogen secretion.

Many other hormones play a role in regulation of growth, with the most important being (appropriately!) growth hormone, technically known as somatotropin. Nutrition also is critically important, with supplies of energy and metabolizable protein furnishing the fuel and building blocks for new tissue. Furthermore, nutrients can serve as signals that work through other hormones, growth factors, or transcriptional regulators to support the processes necessary to result in production of new tissue.

The biological processes underlying growth can be harnessed to create management practices that coordinate with the biology. Most notably, the target growth concept says that animals undergo key events such as puberty at a defined stage of maturity rather than at a certain age. For example, puberty occurs at 45 to 50% of mature size, and heifers should be pregnant by 55% of mature size. At first calving, heifers should be 82% of mature body size. These goals allow producers to set growth rates to ensure heifers meet these targets without fattening. As in most of animal agriculture, it’s better to work with the known biology instead of against it!

Dr. Jim Drackley is Professor of Animal Sciences at the University of Illinois at Urbana-Champaign. Dr. Drackley grew up on a small dairy farm in southwestern Minnesota, and received his B.S. in Dairy Production (1981) and his M.S. in Dairy Science (1985) from South Dakota State University. Dr. Drackley joined the faculty of the University of Illinois in 1989 after receiving his Ph.D. in Nutritional Physiology (1989) from Iowa State University. Drackley’s research program centers on dry period nutrition and metabolism of transition cows, metabolism in the liver of ruminant animals, lipid utilization and metabolism in ruminants, and aspects of calf nutrition and management. He has been awarded over $4.4 million in research funding as principal investigator since 2006. Drackley has edited 2 books and authored or co-authored 1 book, 12 book chapters, 176
scientific articles in refereed journals, and over 400 abstracts, technical reports, articles in conference proceedings, and popular press articles. He has trained 40 graduate students and is consistently on the “List of Excellent Teachers” as voted by the students at the University of Illinois. Dr. Drackley has presented seminars and lectures on dairy nutrition in 30 US states, 10 Canadian provinces, and 24 other countries. Dr. Drackley has received numerous awards for his research and teaching, including the Paul A. Funk Recognition Award from the College of ACES in 2008, and the 2002 American Feed Industry Award for Excellence in Dairy Cattle Nutrition Research and the 2007 Nutrition Professionals, Inc. Applied Dairy Nutrition Award from the American Dairy Science Association (ADSA). Drackley was named a Fellow of ADSA in 2015. Drackley has served on the Board of Directors for ADSA, as President of the Midwest Branch of ADSA, and Chair of the Production Division of ADSA. Dr. Drackley also has worked extensively with dairy and feed industry groups around the world. Currently, he is a member of the National Research Council committee to produce the 8th edition of the NRC publication “Nutrient Requirements of Dairy Cattle”. Drackley resides in Urbana, IL.

Weaned Heifer Nutrition as it Relates to Growth and Future Milk Production
Kristy Daniels, Virginia Tech

In 2017, the dairy industry as a whole is paying more attention to heifers. This is fitting because heifers are the foundation and future of any herd. In the past 20 years, considerable attention has been given to pre-weaned heifers, including two ADSA Discover Conferences dedicated to them. However, once heifers are weaned, less attention is paid to them – be it in research settings or on farms across the US. This “lack of attention” is evidenced by simple keyword searches (e.g., preweaned and postweaned) on popular resource sites such as the Journal of Dairy Science and www.extension.org. Articles focused on preweaned heifers far outnumber those for postweaned heifers on each site. Does this mean that postweaned heifers are not important? Certainly not! This 32nd ADSA Discover Conference will be the first to focus on postweaned heifers and as such, represents: a platform for sharing ideas and a vehicle for advancing knowledge, research, and practical tips for managing this important category of animals.

The purpose of this article and its corresponding seminar are to identify areas in postweaning heifer nutrition that might affect heifer growth and first lactation performance. Emphasis is placed on “might” because limited recent data exists. The 2001 Dairy NRC calculates growth and nutrient requirements for heifers based upon: 1) current age and body weight, 2) target age at first calving, 3) target post-calving body weight (which is based on mature body weight of herd), and 4) predicted chemical composition of weight gain. These things are undoubtedly important, however, “new and different” post-weaned heifer nutrition programs will go beyond meeting NRC guidelines, account for heifer physiology, and formulate diets for specific heifer life events such as: breeding, early-, mid-, and late-gestation, as well as lactation. Nutritionally directed compensatory growth programs will be reintroduced as a means for generating discussion. In these compensatory growth programs, heifers accelerate their growth after a period of reduced feed intake in order to reach the weight of heifers that were never feed restricted. Researchers at North Dakota State University demonstrated that nutritionally directed compensatory growth programs enhanced heifer development and milk yield. Despite these benefits, widespread adoption of such programs never occurred, presumably due to practical constraints.

Therefore, perceived practical limitations that deter implementation of “new and different” post-weaned heifer nutrition programs will also be discussed. Facility and labor constraints, along with concrete evidence demonstrating that “new and different” heifer nutrition programs work appear to be the biggest hindrances. In conclusion, more scientific research and real-world evidence from innovative farmers are needed to show that design and implementation of new and different weaned heifer nutrition programs can favorably impact heifer growth and future milk production in a cost-effective manner.

Dr. Kristy Daniels is an Assistant Professor in the Dairy Science Department at Virginia Tech. She received a BS degree in Animal Science from Michigan State University (2002); she has an MS (2004) and PhD (2008) from Virginia Tech, both in Dairy Science. After receiving her PhD, she worked as a post-doctoral research scientist at the USDA’s Bovine Functional Genomics Laboratory in Beltsville, MD. Before her return to Virginia Tech, Kristy spent nearly 4 years at The Ohio State University as a faculty member in the Department of Animal Sciences. She has teaching experience in: lactation physiology, applied dairy cattle nutrition, and integrative physiology and metabolism. Her research interests are on the nutritional regulation of mammary and rumen development in young dairy cattle.

Stress Biology and Growing Heifer
Jaymelynn Farney, Barry Bradford, and Caroline Ylioja Kansas State University
The main objective of developing replacement heifers is for a heifer to become pregnant and have her first calf close to 24 months of age. To accomplish these goals a heifer needs to gain weight so that they can reach a physiologic maturity that allows puberty to occur and continue growing to reach mature weight. Outside of inadequate nutrition, some stressors can negatively impact growth and reproductive efficiency including, but not limited to; environmental, health, and behavioral stressors.

Heat and cold stress are the two predominant environmental stressors. Heat stress increases the body temperature and respiration rate while reducing feed intake, daily gains, and milk production; regardless of type or production class of mammalian. In general the physiological shifts observed with heat stress include lower glucose, higher cholesterol, higher insulin and lower insulin growth factor-I (IGF-I), all of which can inhibit daily gains (Nteeba et al., 2015). Heat stress has a more pronounced affect on lightweight, young dairy heifers than older, heavier weight heifers (Nonaka et al., 2012). Heat stress impacts on reproduction have been reported to be increases in plasma prolactin, with lower DMI, cortisol, and progesterone than heifers maintained in a thermoneutral environment (Ronchi et al., 2001); while the pair-fed feed restricted heifers did not have the same blood metabolite changes. To further compound the issues with heat stress, at time of insemination a greater number of retarded/abnormal embryos and/or more unfertilized ova than thermoneutral control heifers (Putney et al., 1988, 1989). Cold stress can also inhibit daily gains and reproduction. Heifers experiencing extreme cold stress will have lower estrual activity (Gwazdauskas et al., 2012), lower pregnancy rates, and higher early embryonic death less (Chebel et al., 2007).

Health stress can be detrimental to the animal in multiple ways, but all have some drains on energy and protein. Across multiple mammalian species the cost of the immune response can range between 10 and 40% of the basal metabolic rate (summarized by Lochmiller and Deerenberg, 2000). Amino acid costs for an immune response have been estimated to be ~10% of baseline requirements (Klasing, 2007). When there is competition for resources (immune cells vs. tissue cells) then one facet of metabolism will be restricted and this is generally tissue accumulation. In addition to reductions in ADG, health stresses can potentially impair ovulation as evidenced by an LPS challenge reducing lutenizing hormone (LH) pulsatility and mean concentration of LH (Daniel et al., 2002). Bovine respiratory disease (BRD) events have been associated with increasing the age at first calving in dairy heifers (Rossini, 2004, Bach 2011; Stanton et al., 2012). Parasitic infections, especially internal parasites, are a concern primarily for grazing cattle, but their negative effects on ADG and health have been well documented. Grazing replacement dairy heifers that have not been treated with an anthelmintic reach puberty later with a reduced number of parenchyma than treated heifers (Perri et al., 2013).

Behavioral stresses might be the most difficult stressors to manage in replacement heifer development. Dominant heifers have been found to have a higher ADG and reach puberty earlier than subordinante pairs in a dyad (Fiol et al., 2017). Extreme dietary transitions can have severe negative impacts in gains and maintaining pregnancy. In a beef heifer study heifers developed in the feedlot lost significant weight in the first week of being on pasture versus those that were developed on pasture (Perry et al., 2009). After that initial week heifers had similar ADG. Temperament is also something that is of greater concern to beef cattle producers as heifers that are “flighty” and “fast” have reduced ADG and DMI (Bruno et al., 2016) and wilder cattle are negatively correlated with gains (Black et al., 2013).

Managing stress in replacement heifers should be included in all managerial decisions. Some stressors are easier to manage than other, but having an understanding of these different stressors can help with potentially altering breeding seasons, dietary transitions, and keep/cull decisions, to name a few.

Dr. Jaymelyn Farney is an Assistant Professor for Kansas State University with roles in both Extension and Research. Jaymelyn’s title is a Beef Systems Specialist, however, her pedigree includes research and experiences in both the Beef and Dairy worlds. Jaymelyn grew up on a cow-calf operation in New Mexico then came to Kansas on a livestock judging scholarship. She completed her BS in Animal Science from Kansas State University (2007). While at Kansas State she worked in Dr. Brad Johnson’s laboratory and found that she enjoyed understanding the mechanisms behind biologic responses. After completing her BS she went to work on her MS at Oklahoma State University (2009) under the guidance of Dr. Clint Krehbiel where she focused on gene expression differences in healthy versus chronic cattle that suffered from bovine respiratory disease (BRD). After OSU, Jaymelyn’s interest in health and metabolism interactions lead to her to work with Dr. Barry Bradford at Kansas State University (PhD completed 2012) where she used the dairy cow as the model for inflammation effects on production. Specifically, Jaymelyn and Dr. Bradford worked on the transition dairy cow and tried to modulate fatty liver disease by use of the non-steroidal anti-inflammatory drug, sodium salicylate. In Jaymelyn’s current role as a beef specialist, she works primarily with cow-calf producers to develop management practices to improve and sustain cattle production. Jaymelyn has a strong interest in replacement heifer development as she is the director of the Sunflower Supreme replacement heifer program that
provides guidelines for health and reproduction of bred heifers to minimize calving issues, improve subsequent breed-up rates, and greater longevity within an operation.

Impact of Pneumonia on Rearing Replacement Heifers
Sheila McGuirk, University of Wisconsin School of Veterinary Medicine

Bovine respiratory disease (BRD) is a complex syndrome that affects cattle of all ages. Exposure to viral and bacterial pathogens, lowered immune status, environmental factors, stressors and other risk factors are amongst the component causes of BRD that make dairy heifers one of the most susceptible management groups. The earlier the onset of BRD in calves and heifers, the more likely that negative impacts on growth, reproductive performance, milk production and early removal from the herd will be realized. Morbidity and mortality data for BRD in dairy heifers shown in the table below are responsible for significant economic losses that have been calculated to be as high as $77 per heifer on the dairy.

Table 1. Morbidity and mortality estimates for BRD in dairy heifers.

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<th>Morbidity (%)</th>
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<tr>
<td>Preweaning</td>
<td>12-20</td>
<td>2.3</td>
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<tr>
<td>Weaned</td>
<td>11.2</td>
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<td>Pregnant</td>
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As vaccination is the mainstay of BRD prevention, antibiotics are the mainstay of metaphylaxis and therapy. In a recent study by the author, preweaning antibiotic use for respiratory disease was $167 per calf. Despite the economic importance, loss of production, profitability and concern for welfare of cattle with BRD, surprisingly little progress has been made in reducing its impact. Advances will require uniformity in the BRD case definition. Respiratory disease can be due to upper or lower respiratory tract problems. BRD that is characterized as pneumonia can be lobular or lobar in its distribution, clinical or subclinical in its manifestation, acute or chronic in its duration. Typically, producer or untrained observer characterized BRD significantly underestimates its prevalence amongst calves and heifers but improved detection through defined clinical signs screening methods and remote temperature, activity or appetite monitoring systems will facilitate early detection and improve treatment outcomes. Thoracic ultrasound has greatly enhanced our ability to characterize lung consolidation and, coupled with clinical signs evaluation, finds subclinical BRD and allows upper respiratory tract BRD to be distinguished from lower respiratory tract disease cases. Such information is invaluable to studies of novel treatment strategies that utilize untreated controls or investigations focused on animals less susceptible to BRD. Genomics has greatly enhanced the study of BRD. Utilizing metagenomic approaches, previously uncharacterized viruses and bacteria have been associated with BRD in dairy calves. Ongoing work seeks to modify susceptibility and enhance BRD resistance of dairy cattle through genetic selection using dairy predicted transmitting ability (PTA) for susceptibility to BRD. Important progress in prevention and treatment of dairy heifer BRD requires that more data be generated based on blinded, randomized, controlled clinical trials conducted under a variety of modern calf and heifer rearing management settings and conditions.

Dr. Sheila McGuirk is a Professor Emerita at the University of Wisconsin School of Veterinary Medicine. After receiving a BS degree from Cornell University, she earned a DVM from the University of Georgia College of Veterinary Medicine, an MS and PhD from the Ohio State University College of Veterinary Medicine. Certified by the American College of Veterinary Internal Medicine, Sheila completed a clinical internship and residency training program at Ontario Veterinary College and the Ohio State University, respectively. Her clinical and teaching interests were focused on the integration of individual animal diagnostic, therapeutic and preventive medicine strategies into herd-based applications and problem solving. Her research interests were similar, while striving to develop tools and protocols that would result in early, accurate disease detection, effective treatment, and enhanced production, welfare and performance of cattle. Sheila has been honored with many teaching awards, AABP’s Award of Excellence and the Wisconsin Veterinary Medical Association’s Veterinary of the Year two times.

Heifer Mastitis Prevention and Control
Steve Nickerson, University of Georgia
Replacement heifers are critical to dairy herd productivity because they represent the future milking and breeding stock of all dairy operations. The goal in raising these animals should be to provide an environment for heifers to develop their full lactation potential at the desired age with minimal expense. Animal health and well-being play vital roles in achieving this potential, and one disease that can influence future productivity is mastitis caused by Staphylococcus aureus, the coagulase-negative staphylococci (CNS), and the environmental streptococci.

The presence of mastitis in young dairy heifers is generally not observed until freshening or until the first clinical flare-up in early lactation. Thus, animals may carry intramammary infections (IMI) for a year or more before they are diagnosed with mastitis, resulting in reduced future milk yield. The greatest development of milk-producing tissues in the udder occurs during the first pregnancy, so it is important to protect the heifer mammary gland from pathogenic microorganisms to ensure maximum milk production during the first and future lactations.

Both nonlactating and lactating cow antibiotic infusion products have been used successfully in heifers to cure existing infections and reduce somatic cell counts (SCC), and nonlactating cow therapy prevents new IMI with environmental streptococci. However, the goal is to prevent new infections from occurring in these young dairy animals through management strategies aimed at vaccination, use of teat seals, fly control, and dietary supplementation.

Results of commercial vaccine trials illustrate that immunization will reduce Staph. aureus mastitis in heifers at calving between approximately 45 and 60%, with reductions in SCC of 50%. Infusion of commercial teat seals approximately 1 month prepartum reduced the risk of clinical mastitis by 68% and reduced the risk of IMI due to Streptococcus uberis by 84%. Likewise, a fly control program for heifers will decrease incidence of Staph. aureus mastitis by up to 83%. Lastly, dietary supplementation to boost the immune systems of heifers has been shown to reduce incidence of mastitis at calving, lower SCC, and increase milk yield.

As global milk quality standards become more stringent, management practices based on curing existing infections and preventing new IMI in heifers will ensure that these young dairy animals enter the milking herd free of mastitis and with low SCC. Such practices should be considered for incorporation into dairy herd health programs in herds suffering from a high prevalence of heifer mastitis, especially that caused by Staph. aureus. Not only do these practices reduce new infections in first calf heifers at parturition, they also reduce the introduction of Staph. aureus to the milking herd, and help to maximize milk quality.

Dr. Steve Nickerson did his undergraduate work at the University of ME (BS – 1972), his graduate training at Virginia Tech University (MS – 1976, PhD – 1979) and his postdoctoral studies at Purdue University. He subsequently joined the faculty at LSU as Director of the Mastitis Research Laboratory in 1980, where his research focused on mastitis control and milk quality in dairy cattle. He moved to Virginia Tech in 2000, where he served as Department Head of Dairy Science and Director of the Ag Tech Program. He is currently a Professor of Dairy Science at UGA, and conducts research on management strategies to enhance the bovine immune system against intramammary infection.

Impact of Disease in Heifers on Future Production
Michael W. Overton, Elanco Knowledge Solutions

In the past decade, the supply of dairy replacement heifers has increased due to many factors including improved reproductive performance in the lactating herd and the widespread use of sex-sorted semen. Formerly, most herds kept all the heifers that were produced because they needed them to enter the lactating herd to replace culled cows. However, with an increased supply of heifers, consultants and producers are increasingly becoming more selective about which heifers enter the lactating herd as replacements. Genetic potential is but one area of increased selection pressure. Another area of interest is in trying to better understand the impact of disease during the growing period on future productivity.

The published literature contains a number of studies that have examined the impact of bovine respiratory disease and/or diarrhea on growth rates and on production following calving. However, the associations between disease and productivity are very inconsistent. In examining the reasons for the inconsistencies, multiple factors are likely involved. First, the definition of disease used often varies by farm. Second, the detection approach used differs considerably. Some herds have very high recorded incidence while other herds record very little. Third, many herds already cull the worst performers from the herd prior to entering the breeding population as heifers. Thus, the evaluations are more likely performed using comparisons
between those with no recorded disease and those with mild to moderate disease. In any of these situations, multiple biases preclude the “clean” evaluation of the true impact of calf and heifer disease on productivity as adults.

For the purposes of this conference, retrospective analyses of data from four large herds were performed to describe the heterogeneity of measured impact of disease on growth, reproductive performance and culling risk as heifers, and on the milk production, reproduction, and culling risk as first lactation animals. Multivariable models were built and included a measurement of genetic value (PTA Milk), Herd, Disease X Herd interaction terms, and biologically meaningful potential factors. In three of the four herds, a negative association between respiratory disease and early growth and performance was observed. Heifers with respiratory disease had higher culling risks, lowered likelihood of pregnancy by 500 days of age, reduced 305d milk production, and a higher culling risk by 90 days in milk. Recorded diarrhea also had negative effects but not to the same degree as respiratory disease.

Dr. Michael Overton received his B.S. (1986) and D.V.M. (1990) from North Carolina State University and practiced veterinary medicine for 8 years in North Carolina. After a move to California to complete a Dairy Production Medicine Residency and his Masters of Preventive Veterinary Medicine degree (2000), he worked as a Dairy Production Medicine Specialist at UC Davis-VMTRC in Tulare, CA for 6 years. Then, he joined the University of Georgia – College of Veterinary Medicine where he served as Professor of Dairy Production Medicine and chief of service for the food animal program for about 7 years. In May 2012, Dr. Overton left his tenured position at the University of Georgia to assume a Dairy Analytics position with Elanco Knowledge Solutions. In this role, Dr. Overton is responsible for developing economic models and tools for both internal and external customers, for providing consultative services to dairies and their consultants, and for building analytical capabilities for the global Elanco team. Throughout his professional career, Dr. Overton worked extensively in the areas of reproductive management, transition management, analysis of on-farm records, and economic decision making. He has been active in service to the dairy industry and travels frequently to speak and consult in the U.S. and internationally. He has authored or co-authored over 100 peer-reviewed, proceedings or industry publications on various topics regarding dairy production medicine. Dr. Overton lives in Athens, Georgia with his wife Carol. Their son, Justin, works for ANC, a turnkey technology service provider in Atlanta. Their daughter, Audrey, is a recent graduate from at Mercer’s Georgia Baptist College of Nursing and is married and living in Blairsville, Ga.

Impacts of Feeding and Housing Management on Heifer Behavior and Wellbeing
Trevor DeVries, University of Guelph

For the replacement dairy heifer, rearing practices should be designed to allow for high, consistent growth rates so that heifers are bred at a targeted age, calve out on time, and produce to their maximum potential once in lactation. Another goal should be to achieve these targets without compromising animal health or welfare.

We have seen much advancement in replacement heifer research particularly that related to nutrition, directed to these goals. Concurrently, we have also seen a significant rise in the amount of scientific research relating behavior to the management of dairy cattle, particularly with respect to the interaction with health. While much of this research has been focused on calves and mature cows, there is a growing body of literature on the behavior of replacement heifers.

Much of the research on replacement heifers has been focused on using information on the natural behavioral patterns of these cattle to make management decisions that are beneficial for their growth, health, and welfare. In addition to these immediate implications, that research has also identified areas where management practices may play a role in the development of behavioral patterns. For example, nutritional management and housing may not only impact meal patterning, feed selection (sorting), and competitive behavior while eating, thus having direct impacts on achieving consistent nutrient intakes and growth, but these behaviors may also be learned and persist, having consequences for health and production later on in life. Other, less studied areas, which may have immediate and long-term consequences, include adaption of lying behavior to novel environments, and development of grazing behaviors. It is anticipated with continued knowledge in all these areas, rearing programs for replacement heifers can be developed and implemented so that these animals may be raised for maximum production potential, while maintaining their immediate, and long-term, behavioural needs, health, and welfare.
Dr. Trevor DeVries is a Canada Research Chair in Dairy Cattle Behavior and Welfare and an Associate Professor in the Department of Animal Biosciences at the University of Guelph. Trevor received his B.Sc. in Agriculture from The University of British Columbia (UBC) in 2001. Immediately following he began graduate studies at UBC, focusing his research on dairy cow feeding behavior. After receiving his Ph.D in 2006 from UBC, he worked for one year as a post-doctoral researcher at Agriculture and Agri-Food Canada, focusing his research on ruminant nutrition. In 2007 he was appointed as faculty with the University of Guelph. In his current position, Trevor is involved in research and teaching in the areas of dairy cattle nutrition, management, behavior, and welfare.

Genomics to Manage the Herd
Dan Weigel, Zoetis

The use of genomically enhanced predictions of genetic merit has proven to be particularly useful for improvement of traits that have low heritability and/or are observed after reproductive maturity. Application of this methodology allows for routine genetic evaluations of traits such as reproductive performance, herd life, disease outcomes, and livability today with more traits to be added in time. If we are able to select for cows that can remain in the herd longer with decreased health events, a greater percentage of the herd would be at mature, peak productivity. As few replacements would be needed, producers can increase the intensity applied to selecting heifers. Further, it is also be possible to leverage gender-sorted semen to allow for use of beef semen to generate value-added calves while the use of beef embryos would also ensure more singleton births from multiparous cows.

Dr. Dan Weigel grew up in Iowa on the family farm (Weigeline Holsteins) and graduated from Iowa State University with a BS in Dairy Science (1987) He received both his MS (1991) and PhD (1994) from Virginia Tech, with his dissertation focusing on the prediction of genetic merit for lifetime profitability in Holsteins. Before joining the R&D group of Zoetis (formerly Pfizer Animal Health) in 1995, Dr. Weigel served as a post-doctoral fellow at the University of Guelph working on the implementation of Multiple Across Country Evaluations (MACE) for conformation traits of Holstein sires. Dr. Weigel’s current role with Zoetis is in Outcomes Research and he also remains active as a breeder of dairy cattle.

Genomics + Phenotype to Manage the Herd
Brad Nosbush, Nosbush Dairy

The genetic progress of a herd can be tracked by comparing genomic results for individual traits to percentile rankings for those traits by year of birth. Evaluating changes in phenotypic traits recorded in farm herd management software can be accomplished by comparing performance of high ranking animals to low ranking animals for the trait of interest. Even though many question the wisdom of including traits with low heritability such as Daughter Pregnancy Rate (DPR) and Somatic Cell Score (SCS) in selection indexes, their impact is easy to see when evaluated in herd management software. Selection pressure for any trait will be correlated with responses of other traits – both positive and negative.

Health traits which allow animals to reach their third, fourth and fifth lactations are much more important to profitability than production level in first lactation. Productive Life (PL) measures how long an animal is productive, but is not predictive of which health issues are likely to occur. Genomic predictions for diseases such as mastitis, metritis, retained placenta, displaced abomasum, ketosis and lameness are available for use in selection indexes. Somatic Cell Score is a good example of a disease trait that has been very effective in reducing mastitis, but a more direct measure of clinical mastitis will drive progress faster.

Further development of economically important traits will affect how selection indexes are weighted. Economic indexes are the most accurate when all traits of economic importance are included. The congruent argument that economic selection indexes should not put positive weight on detrimental traits is also true. Most confirmation traits are detrimental to profitability but are still included in many economic based indexes.

Safe, effective and proven management practices have been lost because of social pressure. To fill this void, genetics and the opportunity to express full genetic potential, will be paramount to increasing sustainability of dairy production. Genetics which deliver efficient production, decrease labor, decrease premature culling, improve health and increase the apparent welfare of the animal will be valuable. Sire selection and software development will be the most important drivers of new high value traits at the farm level. Female side technologies (IVF, ET, sexed semen, culling strategies, terminal cross breeding) will become increasingly important but will never match the male side. Heritage
management strategies (corrective mating, classification, dairy judging, rotational crossbreeding) will continue to move towards obsolescence.

Brad Nosbush received a BS in Agricultural Economics (1992) and a MS in Animal Science (1994) from the University of Minnesota St. Paul. He is a partner in Nosbush Dairy with his brothers David Nosbush and Leroy Nosbush. Nosbush Dairy consists of 730 Holstein cows, 650 young stock and 1400 acres of cropland. Brad oversees nutrition, genetics, construction and land acquisition for the dairy. Over thirty bulls have entered AI carrying the Bush-Bros prefix since 2013. Brad currently serves on two cooperative boards and is active in church, school and 4-H. Brad takes great joy in educating sire analysts about the needs of commercial dairyman.

Custom Heifer Rearing
Darin Mann, M&M Feedlots

There are so many different methodologies to raising dairy replacements. In the competitive industry of custom heifer raising you must be able to distinguish yourself and show added value to your dairy clients all while being economically efficient. I will attempt to explain that raising dairy calves and heifers comes down to three basics steps. However, each one of these steps must be benchmarked and measured.

Darin Mann of Parma, Idaho is the third-generation owner of the family farm. Darin’s grandfather, Charles, established the 500-acre farming operation (Mann Farms) in 1947. In 1972 Darin’s father Kent joined the operation and built a 10,000-head dairy heifer replacement feedlot (M/M Feedlot). In 2002, Darin returned to the family business and has built a 15,000-head day-old calf ranch (3 Rivers Calf Ranch). Before returning to the farm, Darin graduated from BYU with a BA degree in International Studies and Chinese. He also spent two years serving an LDS Church mission to Sydney, Australia. After Darin married his wife Alison, they moved to Taiwan for a year and taught English to elementary kids. They are now busy raising their four children: Kennedy (13), Brooklyn (11), Trevor (9), and Kate (7). Giving service has always been a big part of Darin’s life. He has served as the Idaho State FFA President, President of the Dairy Calf & Heifer Association, on the Parma City Council, and most recently has been a Scoutmaster in the Boy Scouts of America organization.

Herd Level Dynamics and Management Impact on Production and Profit 1
Mike Van Amburgh, Cornell University

The dairy industry continues to evolve and new technologies are available that improve the ability of the industry to supply high quality, high genetic merit replacement heifers in support of voluntary and involuntary culling. The dairy replacement program is primarily a cost center and accordingly has historically received less management pressure because most management effort on dairies is focused on the profit center related to milk production. The industry can produce a heifer that has greater genetic and phenotypic potential to make milk, thus helping to overcome the cost to raise her through increased milk yield and potential revenue. However, the only way to lower the expenses related to a cost center is to reduce the overall cost and for dairy replacements. The largest costs are related to the time it takes to calve and the number of heifers that are being raised relative to the static herd size. Age at first calving (AFC) is an important number because it determines the length of unproductive life, however data would also suggest that younger calving heifers are also the most productive heifers and that AFC is strongly correlated with herd life and thus productive life (e.g. heifers calving at younger ages, as low as 21 months, have the greatest productive life). Along with AFC, the other opportunity is to ensure proper growth benchmarks are achieved (first post calving body weight at 82% of mature size of the mature cows) so when the heifer calves in, she is capable of producing milk equal to 80% of the production of the mature cattle (third lactation) in the herd. Heifers that fail to achieve 80% of mature cow milk either at peak milk or for the overall lactation are typically smaller than 82% of the mature cattle will partition nutrients to growth at the expense of milk yield and this results in lost revenue and net farm income from the first lactation cattle.

In addition to time and productivity, inventory costs are significant effectors of profitability and most dairies should be able to operate with approximately 60-65% heifer inventory to cow inventory. However many dairies have heifer inventories in excess of 90% of lactating cattle and at the high end, up to 120% of cow inventory. The availability of sexed semen has helped provide an excess of heifers on farm and because the industry has not adopted alternative culling strategies in earlier life, this technology has allowed for significant inventory growth and greater voluntary culling.
on dairies because of availability. With the cost to raise heifers between $2,200 and $2,400 per animal, a small change in inventory has a significant impact on the expense related to heifer enterprise. For some herds, the additional cost of inventory can easily exceed $100 per lactating cow and in many cases approach $300 per cow, negatively impacting net farm income. In periods of low milk price and low marginal return, eliminating heifers that are not necessary to maintain herd size can have a significant impact on the profitability of the dairy.

Dr. Mike Van Amburgh is a Professor in the Department of Animal Science and a Stephen H. Weiss Presidential Fellow at Cornell University where he has a dual appointment in teaching and research. His undergraduate degree is from The Ohio State University (1984) and his Ph.D. is from Cornell University (1995). He teaches multiple courses and leads the Cornell Dairy Fellows Program, advises approximately 50 undergraduate students and is the advisor for the Cornell University Dairy Science Club. For the last 20 years, a major focus of his research program has been to describe the nutrient requirements of dairy calves and heifers and aspects of endocrine control of developmental functions such as mammary development. This has evolved into describing and working to understand factors in neonatal life that establish lifetime productivity functions and outcomes. Mike currently leads the development of the Cornell Net Carbohydrate and Protein System, a nutrition evaluation and formulation model used worldwide and through that effort is focused on enhancing the efficiency of nutrient use by ruminants to improve the environmental impact of animal food production. A significant focus of his current work is to understand whole animal and ruminal nitrogen metabolism and amino acid supply and requirements to enhance the development of the Cornell Net Carbohydrate and Protein System. Further, his group is active in developing methods to better describe the interaction between forage and feed chemistry, rumen function and nutrient supply to compliment the model. He has authored and co-authored over 70 journal articles and many conference proceedings and is the recipient of several awards including the American Dairy Science Associate Foundation Scholar Award, the Land O’Lakes Teaching and Mentoring Award from ADSA, the American Feed Ingredient Association Award for Research, the CALS Professor of Merit Award and the CALS Distinguished Advisor Award.

Herd Level Dynamics and Management Impact on Production and Profit 2
Greg Bethard, G&R Dairy Consulting, Inc.

A replacement herd is not required for dairy production, yet most dairy businesses choose to control and operate this critical supply chain. It is integrally associated with replacement costs, the 3rd highest cost of producing milk for most dairy businesses. Dairy owners should be striving to minimize replacement costs, which encompasses heifer growing practices, culling practices, and strategic direction of the dairy business. Dairy businesses should make strategic choices relative to rearing replacements which align with the strategic direction of the dairy. Forecasting, planning, and projecting, combined with vision and resource allocation allow a dairy business to plan for success.

Dr. Greg Bethard received his BS (1991), MS (1995), and Ph.D. (1997) degrees from Virginia Tech in dairy nutrition and management. He has served on faculty at New Mexico State University and North Carolina State University, and as a technical services specialist for Monsanto Dairy Business. Since 2000, Greg has operated G&R Dairy Consulting, Inc. with his wife Rachel. G&R Dairy Consulting, Inc. is an international dairy consulting firm focusing on nutrition, facilities, management, business planning, and financial and records-analysis services. In 2014 Greg became CFO for the Pagel Family Businesses in Kewaunee WI, including Pagel’s Ponderosa Dairy, High Plains Ponderosa Dairy, Dairy Dreams, Coleman Ponderosa Heifers, Ron’s Wisconsin Cheese, The Cannery Public Market and Restaurant, and Ponderosa Dairy Products. He is also a partner in High Plains Ponderosa Dairy in Plains KS, and serves as General Manager. Greg has published articles in the Journal of Dairy Science and written articles for various dairy industry magazines. He has also given presentations to dairy producers and allied industry around the globe.