ADSA-SAD Dairy Production Undergraduate Competition

149 Colostrum replacers in neonatal dairy calf management. E. Eckelkamp*, *Louisiana State University, Baton Rouge.*

Colostrum, the first and most important feed given to a newborn calf, is the primary source of nutrients for the calf and also provides essential and irreplaceable antibodies. The main concern with colostrum in general is its concentration of immunoglobulins, particularly IgG. A colostrometer is used to measure colostrum quality, with a 50 g/L concentration of IgG considered the benchmark for good quality colostrum. Maternal colostrum varies in quality, and not all colostrum is good enough to feed to a calf to provide adequate immune protection. Colostrum replacers provide alternatives to feeding maternal colostrum. Colostrum replacers are intended to contain the same amount of IgG as good maternal colostrum. When comparing colostrum replacers and maternal colostrum, it is important to consider serum IgG and total protein concentrations in the calf as well as the incidence of failure of the passive transfer of immunity. There are advantages to each type of colostrum product, and these must be carefully evaluated when determining which to use. Colostrum replacers are uniform, with an adequate amount of IgG present for the calf. Maternal colostrum is already present on the dairy and does not have to be purchased. In addition it contains IgG for diseases that are endemic to a specific dairy. There are 2 primary methods of obtaining the immunoglobulins in colostrum replacer. The first is by drying bovine maternal colostrum with a high IgG content, and the second is obtained from dried bovine serum. Several studies have compared the effectiveness of maternal colostrum and colostrum replacers. The colostrum replacers varied in their ability to provide adequate immune protection depending on the concentration of globulin fed. In conclusion, when fed in the correct amounts, colostrum replacers and maternal colostrum are comparable in quality for providing passive transfer of immunity in neonatal dairy calves.

Key words: colostrum, colostrum replacers, dairy calves

150 Genomics: A tool for commercial dairy producers. L. Ellison*, *University of Florida, Gainesville.*

Vigorous, high-producing cows are what dairy producers look for everyday to keep their herds healthy and productive. Cattle have been selected based on best productive traits for centuries, first with observations of phenotypic traits, then with Predict Transmitting Ability data from pedigrees and progeny data. With today's technology, we now have Genomics. Genomics was officially established as a form of genetic selection in January 2009 after a group of researchers developed the bovine genome by sequencing all DNA markers that compose dairy genetics. From 2003 to 2006, geneticists have strove to identify gene sequences within an animal's DNA that directly influence certain traits such as milk production or productive life. Genomics testing currently comes in the form of 3 tests: 3k, 50k, or 800k SNP (single nucleotide polymorphism) tests. For commercial producers, there is a great advantage in using 3k SNP tests in determining future production. Dairy producers can rank animals at an early age assisting them in keeping their best animals for future production and worst ranked animals for culling, or potentially breed to a higher ranked bull for improvement. Producers can make more accurate mating decisions with their heifers and young bulls and use genetically superior bulls with even more reliability. With this knowledge, producers can make better decisions for higher profitability.

Key words: genomics, genetic selection

151 Implementing an accelerated heifer program: Is it worth the risk? S. E. Fraley* and E. L. Karcher, *Michigan State University, East Lansing.*

Increasing feed costs and lower than average milk prices are inhibitory factors making it increasingly difficult for dairy producers to make a profit. With 15–20% of expenses on farms linked to heifer programs (Whitlock et al., 2002), many producers are considering accelerated growth programs for heifers to minimize costs and maximize profits. Our objective was to determine the effect of accelerated growth programs on mammary development and milk production later in life. Increasing dietary energy in prepubertal heifers inhibits mammary growth relative to body growth in a time-dependent manner (Rincker et al., 2008). Brown et al., (2005) observed increases in mammary parenchyma in calves fed milk replacer with 4.4 kcal of ME/g DM and 30.3% CP as well as a starter grain that was 25% CP from 2 to 8 wk of age. Rapid somatic growth after puberty and associated reduced mammary development, are associated with lifetime milk production. Heifers grown at a faster rate than 680 g/d produced 5–10% less milk than heifers not grown at an accelerated rate (Van Amburgh et al., 1998). Heifers on an accelerated growth program would cost the producer less in overall feed and labor because of the decrease in nonproductive day. However, the potential loss in milk production could result in a negative profit, especially if that loss occurred over the complete productive life (Vandehaar, 2001). Although accelerated heifer growth may be an effective tool to reduce replacement heifer costs, the potential loss in income makes this a risky program for dairy producers. Before deciding to implement an accelerated growth program on farm, producers need to weigh all the options and decide if the benefits offset the risks.

Key words: heifer, accelerated growth

152 Genomic testing as a tool for herd development. L. Krueger* and J. Robison, *California State University-Fresno, Fresno.*

The need for an efficient method of herd development has been made apparent through the difficulties in maintaining profitability after a sizeable herd expansion. Breeding programs on herds nationwide have utilized the potential transmitting abilities of sires available for artificial insemination by selecting animals for production based on pedigree. The artificial insemination industry increased efficiency by moving from selection based on pedigree and performance to selection based on genetic potential, determined through genomic testing. Since the beginning of this movement in 2004, the ability to accurately project genetic potential has improved, with a 3000 single-nucleotide polymorphism (SNP) genomic test offered as an alternative to a 50,000 SNP test for practical purposes, at 20% of the cost. The practicality of this technology has also improved with the combination of ear tissue collection and identification establishment. For the producer, genomic testing means the ability to act on advance information that would otherwise take 3 years (heifer development and one lactation) to discover. Due to the availability and practicality of these developments, genomic testing is on the verge of becoming commonplace in the rearing of replacement herd animals as a tool in increasing efficiency and profitability.

Key words: genomics, test, herd development

153 Impact and control of claw lesions in dairy cattle. T. A. Reiter* and J. M. Bewley, *University of Kentucky, Lexington.*

Untreated claw lesions, a leading cause of dairy cattle lameness, are a growing problem for the dairy industry. The cost of a clinical case of lameness has been estimated to be $128 to $627. Although producers may only consider the economic impact of lameness, it is also important for dairy cow welfare. Drendel et al. (2004) reported that 74.5% of heifers had claw lesions before they were 12 mo old and 85.7% had lesions a month before calving. Heifers that had lesions before calving were more likely to have lesions during lactation. Heifers that had lesions during their first lactation had significantly lower milk yields (2,496 kg less per lactation), even if they were not showing signs of lameness. Additionally, claw lesions increase the rate of premature culling and reduce estrus expression and reproductive performance. The claw is softer during lactation causing it to be more susceptible to lesions. Lesions can be categorized as infectious or noninfectious. Infectious lesions include digital dermatitis, heel erosion, and foot rot. Noninfectious lesions include white line lesions, sole ulcers, and sole hemorrhages. In establishing a prevention plan for claw lesions, dairy producers should consider environmental exposure risks. Wet environments with excessive mud and manure lead to soft and worn hooves and increase the spread of infectious agents. Housing or management conditions that result in excessive standing times cause the claw to weaken because the supportive tissue begins to break down and the horn changes shape. Nutritional factors may also contribute to claw lesions including high levels of ruminally available carbohydrates, lack of fiber, inadequate trace minerals, ration sorting, and inconsistent feeding schedules. Footbaths, typically placed in parlor exit alleys, can be used for prevention and treatment of infections using chemical solutions. Producers should work with their veterinarians and hoof trimmers to understand the cause of lesions in their herd to establish herd-specific prevention and treatment plans.

Key words: claw lesions, lameness, hoof care

154 Bacteriophages as a potential treatment for mastitis. E. G. Sumners*, D. R. Winston, and I. K. Mullarky, *Virginia Polytechnic Institute and State University, Blacksburg.*

Mastitis is the most costly disease in dairy cattle. With consumer preferences against the use of antibiotics, the dairy industry needs to identify alternatives treatments for mastitis. Bacteriophages may be an effective alternative method for treating mastitis. The use of bacteriophages has been studied in humans, mice, and dairy cattle. Bacteriophages are viruses that attack and lyse specific bacteria. However, they do not affect normal microflora. Specific bacteriophage isolates have been studied that lyse an important mastitis pathogen, Staphylococcus aureus. A study that compared multiple bacteriophage isolates ability to lyse specific strains of S. aureus in milk. The study also implied that some bacteriophages may lyse at all stages of bacterial growth and others lyse at particular stages of growth. However, another study examined the efficacy of treating S. aureus infected quarters with bacteriophages and found a 16.7% cure rate. Thirteen cows and 18 quarters where treated with bacteriophage isolates for 5 d. The results for the latter study do not support the use of bacteriophage therapy at this time. Future studies should be conducted evaluating different treatment periods and other bacteriophage isolates. Benefits that bacteriophages have over antibiotics include: no affect on microflora; ecologically purity; no side effects; and natural enemies of bacteria. With the use of bacteriophages dairy producers may have a better way to treat mastitis without concern about potential residues and consumer preferences.

Key words: bacteriophages, mastitis, antibiotic-resistant bacteria

155 Heat. C. Hoffner*, *North Carolina State University, Raleigh.*

Providing a comfortable atmosphere for high-producing animals is a necessity. The Southeastern United States is notorious for having hot and humid summer days, which can drastically affect dairy cows and their milk production. Because of this, heat stress is a huge concern among dairy farmers in our area. Cows subjected to heat stress have reduced feed intake, lower activity, higher respiratory rate, increased peripheral blood flow, and higher water loss. These behaviors have a harmful result on the milk production and the physiologic standing of the animal (J.W. West, 2002). Through observation and research, scientists have determined that a balance of environmental changes, genetic enhancements, and proper nutrition will be the answer for maintaining high milk producing dairy cows in this climate. One experiment concluded that shaded cows yielded 10% more milk than non-shaded cows (J.W. West, 2002); results of another study indicated that cows increased milk yield by 11.6% when sprayed with water for 90 s every 15 min (Strickland, et al., 1988). Genetic adjustments can be altered by monitoring cows of different hair colors. A Florida- based study specified that light-haired cows have a lower body temperature and a greater milk yield than those who are dark-haired (Hansen, 1990). Currently, more research is being conducted to determine if a heat tolerant gene can be used in dairy breeding in the future (J.W. West, 2002). Nutritional advances are emerging for boosting milk production from cows in these environments. It has been reported that providing chilled water to dairy cows improves milk yield by dropping the body temperature through absorbed heat energy (Milam, et al. 1986). Overall, heat stress can adversely affect milk production and also be harmful to the health of dairy cows. With moderate adjustments over time, cows in hot and humid climates can be more comfortable leading to more money in farmers' wallets.

Key words: heat stress, milk production, humid environment

156 Direct-fed microbials: Decreasing scrutiny and increasing productivity. A. Sassard* and J. Fain, *Clemson University, Clemson, SC.*

With increasing concerns regarding safety of the US food supply, producers are increasingly under scrutiny to reduce the use of antibiotics and growth hormones throughout the dairy industry, from calf to cow. Producers are taking the right steps forward with novel health management practices focusing on prevention of problems and promotion of animal welfare while increasing economic productivity. Direct-fed microbials (DFMs), which are biologically active microorganisms that may be used as supplements, have the potential to replace antibiotics in health management programs. Microorganisms utilized as DFMs can be either bacteria, such as *Megasphaera elsdenii*, or fungal, such as *Saccharomyces cerevisiae*. Current methods of using DFMs for dairy cattle range from treating sickly calves to stabilizing the rumen of dairy cows in lactation. Studies investigating the usage of DFMs in adult dairy cattle confer their ability to decrease metabolic problems associated with transition cattle and those receiving a high concentrate ration. It appears that DFMs affect the cow through many complex methods of action, which are dependent on the microbe used and its method of delivery. Research has found that transition cows gain the most benefit from supplementation, with DFMs reducing both sub acute rumen acidosis (SARA) and helping to protect the cow against an acute rumen acidosis challenge. SARA can cost the dairy industry up to $1.12 per cow per d, causing permanent losses in productivity and building a foundation for additional challenges such as laminitis. DFMs provide a non-medicated method of supplementing cattle to effectively tolerate dietary changes; tempering rumen bacteria to the presence of lactate and modifying fermentation while increasing productivity by as much as 2.3 kg/d with more effective utilization of fermentation products, namely propionate. Ultimately DFMs have the potential to become a new option to combat current issues plaguing the dairy industry, from food safety concerns to animal welfare, while at the same time making production more efficient and improving a producer's profit margin.

Key words: DFMs, acidosis, food safety

157 Genetic selection for feed efficiency in dairy cows. A. M. Yeiser* and C. D. Dechow, *Pennsylvania State University, University Park.*

Feed costs are the single largest expense on dairy farms, and profitability of dairy farms has been limited by rapidly rising feed prices. Collections of dry matter intake (DMI) from a large number of individual cows can be cost prohibitive, but genetic markers for feed intake could be developed from fewer cows and allow selection for feed utilization. Feed efficiency is defined in different ways. Gross feed efficiency (GFE) is the amount of energy corrected milk produced per unit of DMI. Heritability estimates for GFE range from 0.14 to 0.37. However, GFE does not consider other cow factors such as body tissue mobilization which could inflate GFE estimates. Residual feed intake (RFI) is DMI adjusted for yield and body weight change. RFI has been considered by some researchers because it was thought to reflect differences in basal metabolic rate. Heritability estimates for RFI vary widely (0.01 to 0.69). Some evaluations of genetic variation for RFI consider change in body weight (BW) and body tissue composition, whereas others consider only change in BW. Studies that account for body tissue composition tend to find less genetic variation in RFI. This suggests that basal metabolic rate might not be changed by selection for RFI. BW and body condition score had unfavorable correlations with feed efficiency in one study, with genetic correlation estimates ranging from −0.64 to −0.70. Cows with a smaller body size were more efficient than larger and fatter cows at equivalent levels of production due to the dilution of maintenance requirements. More recently, researchers have suggested evaluating residual yield, which identifies cows with high yield at similar intake and body tissue mobilization of less efficient cows. Regardless of how feed efficiency is defined, there is evidence that genetic selection can allow dairy producers to increase the efficiency of feed utilization in dairy cows.

Key words: feed efficiency, heritability