156 Using supplemental oxygen for newborn calves on dairy farms. H. Kuester* and S. Kehoe, University of Wisconsin-River Falls, River Falls, WI.

Most calf mortality is due to a serious problem called dystocia. Dystocia is when cows have difficulty birthing due to a large or awkwardly positioned fetus. Dystocia has been a direct link to the failure of the passive transfer of immunoglobulins. Barrier et al. (2013) investigated neonatal physiology, survival, health, and growth of 455 calves following the occurrence of dystocia. Calves delivered during dystocia suffered from higher stress, higher mortality, and reduced transfer of immunoglobulins. In other animals, oxygen therapy is used to improve physiological function and reduce stress, therefore, some research has focused on using supplemental oxygen in dairy calves. Bleul et al. (2008) examined the effects of intranasal oxygen on the respiratory state of neonatal dairy calves. Before and after oxygen was administered, researchers evaluated the arterial partial pressure of oxygen and carbon dioxide and oxygen saturation. Results concluded intranasal oxygen significantly improved the survival rate of calves with respiratory distress. Providing calves with supplemental oxygen post-birth may be used to improve the level of passive transfer of immunoglobulins, save farmers time and money and, most importantly, reduce calf mortality.

Key Words: immunoglobulin, supplemental oxygen, calf

157 Grocery by-product waste and how dairy cattle can help. S. J. Garbowski*, A. E. Goho, and G. J. Lascano, Clemson University, Clemson, SC.

Feed is the single largest expense in dairy farm production. Thus, it is important for producers to consider alternatives to traditional feedstuffs that could decrease the cost of feeding the animals while maintaining optimum animal performance. Grocery store waste (GSW) is one option to investigate as an alternative for the use of feeding dairy cattle. This includes fruits, vegetables, and bread/pastry products. Ruminants have the ability to derive nutrients from sources humans and other non-ruminants cannot. Therefore, ruminants can play an important role in recycling discarded materials from grocery stores. A literature review was conducted using online databases, such as Science Direct, Pubmed and Agricola. The objective of this review was to determine the nutritional, economical, and environmental benefits of using GSW to feed dairy cattle by evaluating different processing alternatives available to improve preservation and quality of this product. Grocery store waste takes up space in landfills and also contributes to the production of greenhouse gases. One reason so much grocery store waste is produced is because of the high standards of consumers. Consumers will often not buy produce that is blemished, bruised, oddly shaped, or discolored. These products are still nutritionally valuable, yet they are discarded, and cattle can maximize nutrient utilization if these are incorporated into a balanced ration. Viable preservation options include silage and dehydration. Based on these results, GSW can be fed to dairy cattle, potentially reducing costs, and environmental impact with no detrimental effects on production. Further investigation is required to determine nutritional characteristics and to improve preservation methods.

Key Words: grocery store waste (GSW), preservation, drying

158 Serotonin precursor treatment: An emerging preventative method for hypocalcemia in transitioning dairy cows. C. M. Kenny*, C. C. Williams, and S. J. Blair, Louisiana State University, Baton Rouge, LA.

During the transition period (3 wk pre- to 3 wk post-calving), there is a rapid increase in the requirement for calcium (Ca). This Ca is deposited into the fetus before birth, and at the start of lactation is secreted in large amounts into colostrum. The sudden demand for the secretion of large amounts of calcium rapidly decreases the blood calcium levels of the cow. When this decrease is not corrected for by homeostatic mechanisms, a disorder known as hypocalcemia, or milk fever, occurs. While the causes for this failure of homeostatic mechanisms can vary, the effects of this metabolic disorder are equally harmful. Hypocalcemia predisposes to many other problems, such as ketosis, decreased milk yield, decreased reproduction, and increased incidence of mastitis. While treatment of hypocalcemia is possible, it is more beneficial to prevent the disorder before onset. Recently, it has been discovered that serotonin (5-HT) plays a role in regulating calcium concentrations in the mammary gland. As it is understood, parathyroid hormone related protein (PTHrP) secreted within the mammary epithelial cells (MECs) is responsible for the mobilization of calcium from bones to enter the blood stream at the onset of lactation, and the secretion of PTHrP is induced by increased 5-HT levels in the blood. Therefore, studies have been performed to determine whether or not the presence of 5-HT does in fact better regulate calcium homeostasis. Through both rodent studies and studies with lactating dairy cows, it has been determined that pre-calving treatment with 5-hydroxy-L-tryptophan, a 5-HT precursor, (or 5-HTP) raises serum 5-HT levels and PTHrP levels in the mammary tissue, and that circulating Ca levels are then decreased. This decrease in circulating Ca induces Ca mobilization from bone. This early mobilization of Ca prepares for the sudden increased demand at the onset of lactation, and allows for better maintenance of maternal Ca homeostasis. Because of these conclusions, it has been determined that treatment of cows with 5-HTP before calving is a potential method for the prevention of hypocalcemia.

Key Words: hypocalcemia, prevention, serotonin

159 The effects of grain-induced subacute ruminal acidosis on rumen epithelial transporters and volatile fatty acid concentrations. L. Beckett*, R. White, and D. Winston, Virginia Tech, Blacksburg, VA.

Subacute ruminal acidosis (SARA) accounts for a loss of $400 per cow per lactation across the United States. Often, SARA is defined as a decrease in ruminal pH below 5.5 for multiple hours per day. There are no physical signs of SARA, but typically is associated with decreased dry matter intake (DMI) and a correlated decrease in milk production. Oba, et al. (2014) measured DMI, milk production, milk components, and feed sorting behavior of SARA-tolerant or susceptible cows. Milk yield and DMI were not statistically different between tolerant and susceptible groups; however, the tolerant cows had higher milk urea nitrogen concentrations and sorted feed less. The shift in milk urea N suggests the susceptible animals may have impaired fermentation. To better understand the mechanisms behind SARA, it is beneficial to understand how the rumen environment changes during low pH. Markantonato et al. (2008) conducted an experiment that compared VFA production and absorption rates on a ration designed to simulate SARA
conditions (high concentrate) and a ration high in forage. The authors were able to determine there is a slower turnover of VFA during SARA conditions compared with high forage rations. The SARA-type ration also had a larger amount of acetate present in the rumen. A potential explanation for why VFA accumulate in the rumen during SARA conditions is provided by Laarman, et al. (2016). The study by Laarman, et al. (2016) monitored rumen epithelial transporters during SARA or restricted feeding using Ussing chambers. Total, protein-mediated, and passive diffusion VFA fluxes and the abundance of specific rumen epithelial transporters were measured. The transporters, NHE1 and NHE3 were both positively correlated with protein-mediated flux, and only NHE3 was correlated with total acetate flux. These data suggest that shifts in the rumen epithelium may contribute to the sequestration of VFA that occurs during SARA. All of these studies help characterize animal responses to SARA and help us better understand the underlying biology that drives the economic losses associated with this condition.

**Key Words:** subacute ruminal acidosis, rumen epithelial transporter, volatile fatty acid concentration

### 160 Using genomic selection to improve dairy cattle heat tolerance. C. N. Folmar*, C. M. Truman, and J. M. Bewley, University of Kentucky, Lexington, KY.

Heat stress can be defined as the physiological stress that animals experience when the environmental temperature is above their thermoneutral zone. Dairy cattle begin to experience heat stress around 20°C. During heat stress the animal may have reduced milk yield, feed intake, and reproductive performance. However, when accessing heat stress external factors affect the threshold temperature such as radiant energy, relative humidity, and wind speed. To account for some of these variables, a metric called the Temperature-Humidity Index (THI) is often used. When an animal is more resistant to heat stress, it is considered to be more heat tolerant. Heat tolerance is important in dairy cattle because their bodies produce a large amount of internal heat. Dairy producers select for greater milk production, requiring cattle to increase DMI, indirectly increasing body heat production. When producers make breeding selections based on milk production, heat tolerance decreases. A negative correlation (R = −0.3) exists between milk production and heat tolerance (Ravagnolo and Misztal, 2000). It may be possible to improve both because there is a low correlation between milk production and heat tolerance traits. Milk yield data were collected from 366,000 cows and compared with weather data for an 11-year period. The cows were divided into heat tolerant and heat susceptible groups based on their decrease in milk production while experiencing heat stress. Genomic information was analyzed to predict genomic estimated breeding values for heat tolerance. Two groups of 24 cows that were genetically identified as the most heat susceptible or heat tolerant were exposed to high heat conditions for 4 d. Cows that were genetically typed as heat tolerant displayed a lower reduction in milk production and DMI (Garner, 2016). As genomics continue to improve and heat tolerance is better understood, selection for more heat tolerant dairy cattle may be possible in the future.

**Key Words:** heat tolerance, dairy cattle, genetic selection

### 161 Measuring fecal cortisol metabolites to assess the impact of management stressors on dairy cattle. Y. I. Ruiz* and J. M. Huzzey, California Polytechnic State University, San Luis Obispo, CA.

Cortisol is a hormone that helps animals respond to acute stress and facilitate survival by supporting energy metabolism and helping other hormones like epinephrine increase vascular tone, activate the immune system and increase vigilance. Chronically elevated cortisol concentrations, however, compromise the immune system and increase an animal’s risk for disease. Several management practices occur on a dairy that may cause stress to the dairy cow, such as regrouping and overcrowding. Little work has documented the physiological responses of these kinds of stressful management practices, but this work is important to understand the full impact on cow wellbeing. One challenge with interpreting plasma cortisol concentrations is that handling stress during the blood sample collection can increase cortisol concentrations within a matter of minutes. Researchers have determined that fecal cortisol metabolite concentrations [e.g., 11,17-dioxyandrostenedione (11,17-DOA)] are useful estimates of cortisol production in cattle. Using ACTH and dexamethasone tests it’s been discovered that the concentration of this metabolite parallels that of cortisol in blood with a delay time of 10 to 12 h. Plasma cortisol is also highly variable throughout the day due to its pulsatile release from the adrenal gland; this variation is attenuated in feces, making 11,17-DOA a better measure of overall basal cortisol concentrations when sampling the animal once per day. In a recent study, it was demonstrated that when nonlactating dairy cows are overstocked, 11,17-DOA concentration tends to be greater compared with when they are not overstocked, suggesting that cattle experience elevated levels of physiological stress when forced to compete for resources. The measurement of fecal cortisol metabolites rather than plasma cortisol may be a valuable tool researchers can use to evaluate the magnitude of physiological stress caused by dairy management practices. Identifying and mitigating these stressors is critical for maintaining healthy and productive dairy cows.

**Key Words:** overstocking, fecal cortisol metabolites, stress

### 162 The impacts of manure management in dairy production. B. Young*, West Virginia University, Morgantown, WV.

Manure management on dairy farms is an important aspect of milk production. The lactating dairy cow produces on average 34 kg of milk each day. In doing so, she will also excrete approximately 54.5 kg of manure daily that needs to be collected, stored, and then utilized in an environmental but effective way. Several factors can affect manure management, storage being one of the most crucial. Storage systems can directly influence the value of nutrients within the manure. In addition to having the necessary capacity for storage, farmers need sufficient land base for application of the nutrients, while adhering to environmental regulations. Most states have restrictions on when manure can be spread on cropland based upon weather. If land base is limited, storage volume needs to be increased to collect the manure for a longer length of time. The goal of manure management is to utilize the nutrients from the manure to maximize crop production. Understanding whole farm nutrient cycling and implementing conservative tillage practices can play a large role. These practices are enforced within the Chesapeake Bay watershed to reduce eutrophication, which has changed the operation of many producers. The same issues in the Chesapeake are starting to occur in the Gulf of Mexico. Thus, learning to manage nutrients within the manure can play a vital role in decreasing environmental issues and increasing production within the Mississippi River Watershed.

**Key Words:** eutrophication, dairy farms, nutrient management

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160 Using genomic selection to improve dairy cattle heat tolerance. C. N. Folmar*, C. M. Truman, and J. M. Bewley, University of Kentucky, Lexington, KY.

161 Measuring fecal cortisol metabolites to assess the impact of management stressors on dairy cattle. Y. I. Ruiz* and J. M. Huzzey, California Polytechnic State University, San Luis Obispo, CA.
Invisible impacts of mastitis: The long-term reproductive loss. E. Brenengen* and D. Olver, Pennsylvania State University, University Park, PA.

Mastitis is a disease that all dairies encounter. While the majority of financial losses from mastitis on dairy farms can be attributed to decreased milk production, the negative impact of mastitis on reproductive efficiency and function in dairy cattle is often overlooked. Multiple observational studies have examined the correlation between measures of fertility and the presence of clinical or subclinical mastitis. Reproductive efficiency measurements such as services per conception and days open are negatively influenced by mastitis. Large clinical studies have demonstrated that cows with clinical or subclinical mastitis are at a greater risk for aborting an existing pregnancy. This risk was greatest if infection occurred during the first 45 d of gestation. The effects of mastitis-causing pathogens on fertility are still an area of active investigation. Researchers have proposed various mechanisms to explain mastitis-induced infertility and have estimated economic losses to producers. Although economic impacts differ among dairies, it is clear that mastitis is an important contributor to poor fertility and represents a significant source of financial loss to dairy operations. As producers seek to limit these losses, measures to prevent mastitis and encourage good health in the transition period and during early lactation will become even more valuable.

Key Words: mastitis, reproduction, pregnancy

Evaluating the migration toward automated calf feeders on calf performance. M. Wright* and J. Bohlen, University of Georgia, Athens, GA.

The use of group housing systems with automated calf feeders are gaining in popularity in the United States. This is in stark contrast to the previous premise held that individual housing systems optimized calf health. Recent growth is based on several notable benefits cited for both producer and calf. These automated feeders allow farmers to receive more data on their calves while concurrently reducing labor costs. Another advantage to automated calf feeders is the ability to increase milk volume and number of feedings per day easily. Research regarding the advantage to feeding calves more and with more frequency, has provided mixed results. A portion of research trials suggest that calves allowed a higher volume of milk per day will have higher preweaning average daily gain, which correlates to higher milk yield in first lactation. Yet results from additional studies indicate that calves fed ad libitum milk have lowered rate of gain compared with calves fed a constant amount daily and that these consistently fed calves have higher feed efficiency, which could reduce calf-rearing costs. There is still other work that suggests many calves do not maximize their allotted daily milk, thus are able to optimize their milk utilization based on need. Growth and development of calves is also directly impacted by their health. Health in these group housed systems, research has identified, is a direct reflection of management techniques as is the case with individual housing systems. Finally, training to use calf feeders can require time for calf and producer. Calves should be worked with individually to get them using the feeders independently as quickly as possible. Producers need to give themselves time to adjust to this system of feeding calves and strategically pick management practices that work best for them and their calves. The ability to directly measure the impact of automated calf feeders on calf performance is often blurred by many producer related variables. Therefore, it is important to remember that with this system as with any calf rearing system, the results in calves is only going to be as good as the thoughtful management that went into them.

Key Words: automated calf feeder, group housing, calf rearing