Guernsey breed naturally produces a higher percentage of A2 milk, which may create a new niche market and therefore increase demand for Guernseys nationwide. In conclusion, A2 β-casein milk is a new way to use genetics to create a niche market, potentially increasing sales of fluid milk nationwide.

Key Words: A2 milk

0040 Ultrasonic separation of milk to select for fat globule size distribution. S. P. Itle* and D. R. Olver, *Pennsylvania State University, University Park.*

The size of fat globules is important in manufacturing dairy products such as cheese and butter. Smaller fat globules result in a smooth texture and mouthfeel in cheese, while butter production better utilizes larger globule sizes. Although the cream separator is most commonly used in dairy processing operations to separate cream from milk, centrifugal technology is not commonly used for selecting for a specific fat globule size distribution. This is due to the complexity and nearly-perfect timing needed to control g-forces. Some artisan cheese producers have opted to utilize gravity separation to isolate smaller fat globules, but this process can take many hours while imposing a food safety risk. A new technology, ultrasonic separation, promises faster separation of fat globule fractions than gravity separation. This method utilizes sound waves that can rapidly separate the fat components of milk with a high specificity in globule sizes. In a recent Australian study, ultrasonic separation by dual transducers operating at 2 MHz achieved appreciable fractionation after 20 min and resulted in a 0.9 µm decrease in fat globule size.

Key Words: ultrasonic separation, dairy processing, fat globule fractionation

ADSA-SAD (STUDENT AFFILIATE DIVISION) UNDERGRADUATE STUDENT ORAL COMPETITION: DAIRY PRODUCTION

0041 Gene therapy and the prevention of mastitis in dairy cattle. K. Boudreaux*, *Louisiana State University, Baton Rouge.*

Mastitis in dairy cattle is an inflammation of the mammary gland and surrounding udder tissue, often an immune response to a pathogen invading the teat canal. It can also be a result of chemical, mechanical, or thermal injury to the udder. Mastitis can present clinically or subclinically, so routine testing and examinations are done to prevent the spread of infection. This infection is most often treated with antibiotics, but during antibiotic treatment, the cow's milk is not able to consumed or sold, because it contains antibiotic residues. It is an ongoing epidemic in the dairy industry, and monetary losses are accrued from the milk that must be disposed of due to antibiotic usage, reduction in milk yields due to permanent damage to the udder as a result of infection, labor costs to tend to infected cows, veterinary and medicinal costs, and in extreme cases, premature culling costs. Studies are being conducted to show that gene therapy may be a possible solution to prevent mastitis. Research has been done in an attempt to transfect the udders of dairy cattle with cercropin B, a lytic peptide found in Cercropia moths, that has broad spectrum bactericidal properties. This technology has been applied to other species through different experimental procedures and has yielded favorable outcomes and a decrease in targeted infectious diseases. The research with dairy cattle has not yet yielded favorable results, but with some experimental modifications, could be proven effective in preventing mastitis. This practice, once perfected, could be incorporated in routine dairy farm procedures, such as vaccine administration, and could reduce or eliminate antibiotic treatment of mastitis and reduce the losses of milk unable to be sold because of residual antibiotic contamination.

Key Words: gene therapy, mastitis, dairy cattle

0042 The importance of mastitis management practices in maintaining milk quality in the United States. K. Bochantin* and J. M. Bewley, *University of Kentucky, Lexington.*

Dairy producers strive to achieve optimal milk quality in an effort to provide the highest quality product possible to consumers. Milk quality is highly influenced by management practices used on farms. Poor milk quality may lead to decreased cheese yield and reduced shelf life for all dairy products. Measurements of milk quality include somatic cell count (SCC), bulk tank bacterial counts, antibiotic residues, and nutrient values. Lowered milk quality in certain regions of the United States within the past few years has caused some concerns within the industry, leading to renewed efforts toward improving milk quality. Such changes are centered on key management practices, including mastitis treatment and prevention. Mastitis is one of the most prevalent and costly diseases within the dairy industry, impacting both cows' health and milk quality. Awareness of the disease and its economic impact can increase motivations for change. Prevention of mastitis is key to management of the disease. Management of the environment (including housing and routine procedures) and cleanliness of the parlor can reduce the spread of mastitis-causing pathogens and decrease the risk of contamination. Housing and bedding should be kept clean and dry. In-parlor milking procedures, which include pre- and post-teat dip with proper germicides, can help remove existing bacteria from the udder and lower the risk of mastitis. Heifers are also at risk for mastitis and infection can lead to reduced milk yield during lactation. Prevention strategies include proper management, nutrition, and attention to prepartum udder health. Dry cows have a higher risk of mastitis infections than lactating cows.

Prevention of mastitis for dry cows at drying off includes treating all quarters with antibiotic products designed specifically for dry cow therapy. Vaccinations are also available to prevent against certain strains of mastitis-causing bacteria. Detection and awareness of mastitis is important for proper, timely treatment. Treatment methods can vary based on the severity of the case and can influence milk yield, quality, and overall cow health and performance. Dairy Herd Information Association (DHIA) records can help with somatic cell count management. Culturing of milk to determine bacteriological causes of mastitis can be useful for designing pathogen-specific prevention and treatment strategies.

Key Words: mastitis management, milk quality, United States

0043 The impact of amount and quality of colostrum and subsequent transition milk on calf health and growth. J. Hardy*[1], K. M. Daniels[2], and D. R. Winston[1], [1]*Virginia Tech, Blacksburg,* [2]*Virginia Polytechnic Institute and State University, Blacksburg.*

In the United States, the current "gold standard" is to deliver colostrum to newborn calves at 10% of BW within the first 2 h of life. In practice, many farmers simply offer calves 1.89 L of colostrum within 12 h of birth. For a 43 kg calf, this is about 4.5% of the calf's weight—not even half of the recommended amount. Colostrum ingestion is critical for passive transfer of immunity in the form of immunoglobulins (Ig). Researchers in Ireland examined the effects of feeding different volumes of colostrum (7, 8.5, or 10% of BW within 2 h of birth) and subsequent feedings (0, 2, or 4) of transition milk on serum IgG and health status. Ninety-nine calves were enrolled. They found that calves fed 8.5% of BW within 2 h of birth achieved the highest levels of IgG transfer. Following the initial feeding of colostrum, offering transition milk to calves appears to have positive impacts on calf health. Calves fed two or four subsequent feedings of transition milk seemed to have a lower risk of getting assigned poor nasal and eye scores (Conneely et al., 2014). The researchers were right to focus on measurement of serum IgG concentration in their project calves, as serum IgG is a major indicator of calf health because calves are born agammaglobulinemic. Therefore, when calf Ig measurements are obtained after consumption of colostrum, they reflect Ig content of colostrum and absorptive ability of the calf's small intestine. Colostral Ig absorption is highest in the first 24h of life and declines sharply; this has to do with permeability of the calf's small intestine to large molecules such as Ig. This process is termed passive transfer of immunity and it is key in protecting the calf against pathogens that the dam was previously exposed to, before the calf's own immune system maturing and becoming more functional (Godden, 2008). In conclusion, if colostrum quality is sufficient and calves are managed properly, calves seem to excel at 8.5% of their body weight at birth and when offered a few feedings of transition milk will have improved health and be less prone to disease in the first three to 4 wk of life (Conneely et al., 2014). For a 43 kg Holstein calf, this equates to 3.66 L of colostrum.

Key Words: dairy calf, immunoglobulin

0044 A future for genomics in animal health through the Bovine Respiratory Disease Complex: Coordinated Agricultural Project. S. J. Thomsen* and J. F. Bohlen, *University of Georgia, Athens.*

Whether through animal welfare and antibiotic residual concerns from the public, or the Veterinary Feed Directive, antibiotic use in animal agriculture is increasingly scrutinized and restricted. As such, it is essential for the future of the dairy industry to consider options to reduce the prevalence of disease on farm with new technology while decreasing their dependence on antibiotics. The 5-yr Bovine Respiratory Disease Complex: Coordinated Agricultural Project (BRD:-CAP) funded by the USDA and formed with the help of several universities, scientists and agriculturalists is searching to find new methods of addressing Bovine Respiratory Disease (BRD). Once determining that BRD has moderate heritability at 0.21, the goal of the BRDC:CAP is to utilize new genetic technology and the bovine genome to determine genetic markers for the susceptibility and resistance of Bovine Respiratory Disease and consider the financial impact of BRD genetic selection. Despite increased knowledge regarding BRD and progress in vaccine and preventative technology, BRD continues to be a financial liability of over $692 million dollars to the industry and contributes to 46% of the deaths among weaned calves, while having long-term influences of animal performance and health for affected individuals. Understanding the science behind BRDC:CAP will provide a gateway to analyzing the practicality of such genetic research on the farm. This may provide for its inclusion as a single selection criterion or as part of an index, such as Net Merit, for a sire proof. With this genetic selection for reduction in BRD incidence rates, the average dairy producer could see reduction in financial costs from treatment, calf mortality, and the resulting implications poor heifer development will have on future lactation performance. Continued work is necessary to ascertain the reliability and usefulness of genomics with regards to infectious diseases such as BRD. Increased farm profitability may be realized with proven ability to practically apply this information to the dairy industry.

Key Words: genomics, bovine respiratory disease, farm profitability

0045 Breeding for strength may create frail cows.
A. N. Gabel* and C. D. Decho, *The Pennsylvania State University, University Park.*

The Purebred Dairy Cattle Association Dairy Cow Unified Scorecard assigns 25% of weight to the dairy strength category, which is described as "a combination of dairyness and strength that supports sustained production and longevity." Stronger cattle are assumed by many breeders to have longer herd-life, but data from several studies suggest otherwise. In a 2003 study, relative culling risks (RCR) were assigned based on strength scores (1 = weak to 50 = strong) from 268,008 Jersey cows. A score of 25 equated to a RCR of 1.00. RCR values below or above 1.00 indicated low or high culling risks, respectively. Scores from 11 to 20 were optimal, whereas cows with a score of 41 to 45 were at most risk of being culled (RCR = 1.30). A similar analysis was performed in a study of 891,524 Holstein cows (Caraviello et. al., 2003; 2004), and strength scores higher than 25 were associated with significantly elevated RCR. These two studies indicate that "stronger" cattle have greater culling risk, which may partially be attributed to unfavorable associations with disease. Genetic correlations of strength with displaced abomasum, ketosis, mastitis, and cystic ovaries indicated that selection for strength would elevate disease risks (Zwald et. al., 2004). A 2015 analysis (Dechow) compared chest width and body condition score (BCS) in Canadian Holstein genetic evaluations with the Canadian dairy strength trait and U.S. productive life (PL) and daughter pregnancy rate (DPR). In this study, 527 bulls with Canadian and U.S. daughters were divided into groups based on chest width and BCS. Sires that transmitted wide chests and low BCS had the highest dairy strength scores (+9.5), followed by wide chest and average BCS sires (+6.5). These groups had the lowest PL (–2.5 and –1.6 mo, respectively) and DPR (–2.75% and –1.6%, respectively). In contrast, sires that transmitted narrow chests and high BCS scored lowest for dairy strength (–5.5), highest for PL (+1.1 mo), and highest for DPR (+0.4%). Therefore, high scores for strength suggest decreased longevity and reproductive efficiency. This counterintuitive relationship of dairy strength with health and survival may result from poorly defined measures of strength in linear scoring programs; cows with extremely low BCS have minimal muscle mass but are still considered to have high dairy strength if they have a wide skeletal system. Dairy producers should take caution when breeding for strength.

Key Words: strength, longevity, genetics

0046 The links between uterine infection and infertility.
N. Walker*, *University of Florida, Gainesville.*

The objective of this presentation is to explain the impact that uterine infections have on female reproductive fertility and dairy production. Uterine infections such as metritis and endometritis are prevalent among Holsteins primarily after parturition. Anatomical barriers act as a natural defense against bacterial pathogens, but during parturition these barriers are compromised. While these infections can be treated, they pose lasting negative effects on fertility. *Escherichia coli* and *Trueperella pyogenes* are the most common pathogens that cause uterine infections. These pathogens initiate an inflammatory response in the endocrine signaling system, the endometrium, and the ovaries. The inflammatory responses in these organs, coupled with innate immunity, can overload the female reproductive tract and lead to infertility. It is not known why reproductive fertility is compromised even after the uterine infection is treated. Further research is needed to better understand the exact mechanisms that lead to infertility. When those mechanisms are discovered, there is a potential to intervene before fertility is compromised. There are also current developments for metritis vaccines to prevent uterine infections. Until further advancements are made in those areas, implementing good management practices such as nutrition and hygiene during partition are feasible solutions.

Key Words: cow, immunity, fertility, infection, uterus

ADSA-SAD (STUDENT AFFILIATE DIVISION) UNDERGRADUATE STUDENT ORAL COMPETITION: ORIGINAL RESEARCH

0047 Comparison of calving data among Jersey, Jersey × Holstein crosses, and Norwegian Red × Holstein × Jersey crosses.
S. M. Royal*, K. A. E. Mullen, and S. P. Washburn, *North Carolina State University, Raleigh.*

The dairy at the Center for Environmental Farming Systems (CEFS) has been a pasture-based herd of Holstein (H), Jersey (J), and crosses of those breeds, but now is transitioning into three breed groups: Group A includes pure J and mostly J being bred to become pure Jerseys; Group B includes a two-way criss-cross of H and J breeds by alternating sire breeds each generation; whereas Group C is a three-way rotational cross with Norwegian Red (NR) introduced as the third breed in 2014. The objective of the study is to examine differences in calving characteristics among breed groups across two calving years. Groups included: A (83 calves, J sires), Bh (48 calves, H sires), Bj (60 calves, J sires), and C (94 calves, NR sires), respectively. Breed group ($P < 0.05$), interaction of parity × calving year ($P < 0.01$), and the three-way interaction (breed group × parity × year; $P < 0.05$) significantly affected gestation length. Least squares means for birth weight for groups A, Bj, Bh, and C, respectively were: 26.8 kg ± 0.5 kg, 27.7 kg ± 0.7 kg, 32.9 kg ± 0.7 kg, and 34.5 kg ± 0.5 kg. Parity ($P < 0.001$), breed group ($P < 0.001$), and calf gender ($P < 0.001$) all affected birth weight. Multiparous cows had heavier calves than first parity cows ($P < 0.001$). Group C calves were heavier