

ADSA Southern Section Symposium: Producing Quality Milk in Hot, Humid Climates

170 Extension programming in Kentucky to address somatic cell count challenges and opportunities. J. M. Bewley*, *University of Kentucky, Lexington.*

Recent market changes have renewed interest in lowering bulk tank somatic cell counts (SCC), particularly in the southeastern US states where the highest SCC in the country are observed. Extension programming efforts focused on SCC reduction increased around the country in 2010 and 2011. In Kentucky, we have implemented a multifaceted approach to extension programming for SCC reduction. The University of Kentucky Dairy Extension team has worked closely with the Kentucky Dairy Development Council in a farm-based program entitled M.I.L.K. Counts. The intent of the program is to provide direct, on-farm technical assistance to producers struggling with SCC through evaluation of DHIA records, milking procedures, management protocols, animal hygiene and housing, and dry cow treatment and handling. The M.I.L.K. Counts program incorporates a team-based problem solving approach with emphasis on the economic impact of resulting recommendations. Microbiological culturing is performed by the University of Kentucky Veterinary Diagnostic Livestock Laboratory. Approximately 25 producers have participated in the program with SCC reductions as high as 400,000 cells/mL. YouTube videos were developed (<http://www.youtube.com/user/UKAgriculture>) to demonstrate recommended milking procedures and to provide virtual tours of farms that consistently maintain low SCC. A visual analytics dashboard (<http://tinyurl.com/UKMilkBonus>) was created to illustrate the potential for increased income through SCC reductions. Kentucky herds with annual mean SCC < 250,000 were surveyed to summarize management practices employed by farms successful at maintaining low SCC. When asked to identify the management practice that contributed the most to their low SCC level, the most frequently cited practices were (1) keeping cows and facilities clean (n = 31), (2) maintaining dry, clean bedding (n = 14), (3) adhering to a consistent milking routine (n = 10), (4) forestripping (n = 7), and (5) pre and post dipping (n = 6). Lastly, a series of SCC reduction workshops were conducted across the state working with county extension agents and milk cooperative field people.

Key words: extension, SCC, milk quality

171 Dairy producer adoption of mastitis control technologies for reducing herd somatic cell counts. S. C. Nickerson*, *University of Georgia, Athens.*

Mastitis continues to be a major livestock disease affecting the dairy industry. In the US alone, this disease results in economic losses approaching \$2 billion annually due to reduced milk production, milk discard, veterinary services, antibiotic use, increased labor, and reduced cow sale value. As the industry strives to improve milk quality to meet consumer as well as exportation demands, the legal limit for the somatic cell count (SCC) will likely be reduced from 750,000/mL to 400,000/mL in the near future. It is estimated that between 10 and 20% of US dairy farms, mostly located in the south, are currently at or above the 400,000/mL SCC limit and will have to adopt stricter methods for controlling mastitis in their milking herds, dry cows, and heifers. The 5-point plan of mastitis control has provided the basics of managing this disease for over 4 decades, and includes 1) teat dipping, 2) dry cow therapy, 3) functionally adequate milking machines,

4) therapy of clinical infections, and 5) culling of chronic cows. However, additional measures of control will have to be implemented to reduce mastitis prevalence and the associated elevation in SCC. Such management practices include vaccination, dietary supplementation, and mastitis control in heifers. The adoption of both the proven traditional methods and the more novel technological approaches toward mastitis management by dairy producers is dependent on several factors, and is based on what motivates the implementation of mastitis prevention and control practices.

Key words: dairy producer, mastitis, somatic cell count

172 Effect of micronutrients on the regulation of the immune system and its role in milk quality. W. Weiss*, *OARDC/The Ohio State University, Wooster.*

All cells and tissues require micronutrients to function properly, however immune cells and the immune system are particularly sensitive to the supply of many micronutrients. Stimulated neutrophils and macrophage produce prodigious quantities of free radicals, and metallo-enzymes (containing copper, selenium, or zinc), B-carotene and vitamin E have direct major antioxidant functions that are needed to control those radicals. Marginal deficiencies of Cu, B-carotene and vitamin E reduce the killing ability of bovine neutrophils and these effects are probably caused by impaired antioxidant status. A marginal deficiency of Se reduces both the migration and killing ability of bovine neutrophils. The Se effect on killing ability is probably via antioxidant status but migration effects may be via non-antioxidant selenoproteins. A marginal deficiency of Zn has not been shown to affect killing ability of neutrophils but has reduced migration and phagocytic activity in humans and rodents. Experiments with bovines are limited or lacking, but studies with humans and rodents have shown that Cu, Se, Zn, and vitamins A, D, and E affect gene expression of pro- and anti-inflammatory cytokines and their receptors resulting in altered immune cell function, cell populations, and acquired immune response. Experiments measuring gross lymphocyte responses in bovines generally has found enhanced proliferation of cytotoxic T-cells when chromium is supplemented; increased lymphocyte proliferation with supplemental Se; little effect on lymphocyte proliferation with supplemental Cu; and highly variable lymphocyte responses to supplemental vitamin A, B-carotene and vitamin E. Many micronutrients have profound effects on immune function, however, effects on mammary gland health and milk quality are often less evident. This is likely because control diets may not have been low enough in the nutrient of interest to impair immune function. Diets that are adequate (but not excessive) in Cu, Se, Zn, B-carotene, and vitamins A and E are necessary for good mammary gland health and most studies indicate current NRC recommendations are appropriate for those nutrients.

Key words: vitamins, trace minerals, mastitis

173 Use of records to investigate and monitor mastitis in dairies. M. W. Overton*, *University of Georgia, Athens.*

Mastitis is an infection of the mammary gland that can occur in both clinical and subclinical states and with each, somatic cell counts (SCC) rise and milk quality declines. Changes in SCC that occur as a result of infection can be used to track changes across time. It is helpful to

remember that a herd's SCC is largely the result of 2 things: 1) How many cows get mastitis? 2) How long do cows maintain mastitis? This presentation will demonstrate how SCC and clinical mastitis history can be used to investigate and monitor mastitis issues within a dairy herd. One approach is to identify the herd's clinical mastitis risk by month and by parity to assess the impact of seasonality and age on clinical case risk. Many herds do not accurately or consistently record clinical cases but do utilize monthly DHIA testing. As such, one can use the monthly data to examine changes within a cow and within a group relative to a cut-point of 200,000 SCC. This approach is illustrated in the following table and can give a quick assessment of udder health status and potential sources for further investigation.

Table 1. Common metrics for monitoring mastitis

Item	Description	Goal
Monthly clinical mastitis incidence	% of all milking cows each month that are recorded with one or more cases of clinical mastitis	< 2%
Heifer new infection risk	% of fresh heifers >200,000 SCC at first test	<15%
Dry cow new infection risk	% of cows <200,000 SCC at the last test before dry off that calve and have a first test SCC >200,000	<15%
Dry cow cure risk	% of cows with an SCC >200,000 at the last test of the prior lactation that calve with a first SCC test <200,000	>75%
New mastitis case risk	% of cows that were <200,000 SCC at the previous test but now have SCC >200,000	<9%
Cure risk	% of cows that were >200,000 SCC at the previous test but now have an SCC <200,000	>30%
Chronic cow risk	% of cows with the last two consecutive, monthly tests of >200,000 SCC	<12%
Chronic cow attributable risk	% of current cows >200,000 SCC that were also >200,000 SCC at the previous test	<65%
Uninfected cows	% of cows that with 2 consecutive tests that were <200,000 SCC at both tests	>70%

Key words: mastitis, somatic cells, monitoring

174 Advancing mastitis research: Using proteomics to identify biomarkers and evaluate adjunctive therapies. J. L. Boehmer*, U.S. Food and Drug Administration Center for Veterinary Medicine, Laurel, MD.

Mastitis remains a major focus of dairy cattle disease research due largely to associated economic losses and the limited availability of effective treatment options. Coliform mastitis caused by gram-negative bacteria is particularly problematic because of the fever, pain, and profound host inflammatory response induced by lipopolysaccharide (LPS), a cell wall component of gram-negative bacteria released into the mammary gland following pathogen invasion. The bovine innate immune system is very effective at eliminating gram-negative bacterial species, but a need exists to identify effective adjunctive therapies to treat the secondary local and systemic inflammatory responses caused by LPS. To facilitate new veterinary drug approvals, the Food and Drug Administration (FDA) Center for Veterinary Medicine (CVM) is looking to biomarker discovery, or the identification of a biological marker that can be measured in a fluid such as milk, and that could serve as an indicator of health or disease, or of responses to drug treatment. Historically, characterization of the bovine host response to LPS has been attempted using enzyme-linked immunosorbent assays (ELISAs), but reliance on antibodies can hinder biomarker discovery because the commercial availability of bovine-specific antibodies is limited. Proteomic strategies, including liquid chromatography coupled to mass spectrometry (LC-MS/MS) have emerged as one of the most promising approaches to identifying biomarkers of disease and novel drug targets, primarily because proteomics affords large-scale protein identification, and is not reliant on antibody availability. At CVM, the latest proteomic methodologies are being utilized to identify potential biomarkers of inflammation in bovine milk. The identification of biomarkers of inflammation related to coliform mastitis could advance current knowledge of the disease; biomarkers could also provide the regulatory criteria needed to evaluate the efficacy of potential adjunctive therapies for coliform mastitis, including non-steroidal anti-inflammatory drugs (NSAIDs).

Key words: mastitis, proteomics, inflammation