CMT-Positive Fresh Cow Quarter Cultures

For fresh cow CMT-positive quarters, the sensitivity of the on-farm culture to detect gram-positive quarters was 88%, and the specificity was 70%. Accordingly, 80% of the treated cases were truly gram-positive (PV+), and 81% of the untreated cases were truly uninfected or gram-negative (PV-).

Significance

Predictive values of the on-farm bi-plate versus the laboratory standard procedures are moderately high. However, the test will not be fully validated until the conclusion of the study, when the cost of missing a false negative or the cost of treating a false positive has been quantified. The bi-plate test characteristics to detect and classify bacteria growth appear not to be different between milk samples from fresh cows and clinical cases.

Relationship of Body Condition Score and Oxidant Stress on Tumor Necrosis Factor Expression in Dairy Cattle

N.J. O'Boyle, *BVSc;* **C.Corl; J.Gandy; L.M. Sordillo,** *MS, BS, PhD*
Department of Large Animal Clinical Sciences, College of Veterinary Medicine, Michigan State University, East Lansing, MI

Introduction

Excessive mobilization of body fat in the dairy cow is a well-known risk factor for poor fertility, metabolic problems and increased susceptibility to a variety of infectious diseases. In humans, obese patients have an enhanced production of pro-inflammatory cytokines (such as Tumor Necrosis Factor-alpha and Interleukin-6), which has been recognized to induce a pro-inflammatory environment and facilitate oxidative damage, leading to the initiation and progression of an array of diseases. The purpose of this study was to investigate if a similar relationship exists in the dairy cow between obesity, oxidative stress, pro-inflammatory cytokines and susceptibility to disease.

Materials and Methods

Sixteen pluriparous Holstein cows in mid-lactation (150-200 DIM) were selected from a commercial herd of 3000 dairy cows based on their body condition score (BCS). Eight were selected as normal BCS (2.5-2.7) and the remainder were considered obese with a BCS of >3.5. The animals were all pregnant and balanced for milk yield (average 72 lb; 32.7 kg). They were free of any intramammary infections, lameness or concurrent disease, and this was monitored throughout the trial period. Markers of oxidative and metabolic status were measured, including non-fatty acids (NEFA), total lipid hydroperoxides, antioxidant potential of mononuclear cells, ratio of reduced to oxidised glutathione (GSH/GSSG), glutathione peroxidase activity, thioredoxin reductase activity (TrxR), LPS stimulation of whole blood and TNF-alpha levels.

Results

Obese cows had a significantly lower level of NEFAs compared to normal cows. High-BCS cows also showed indicators of oxidant stress (lower TrxR and GSH/GSSG), as well as elevated TNF-alpha levels.

Significance

Cows with a high BCS are more sensitive to oxidative stress, consistent with reports in human medicine

that showed a relationship between obesity, oxidant stress and increased incidence of disease. Adipose tissue and, in particular, visceral adipose tissue is implicated as a key regulator of inflammation in humans. Adipose tissue secretes pro-inflammatory cytokines such as TNF-alpha and IL-6, which are known to play a major role in the pathophysiology of a number of inflammatory-based diseases, including coliform mastitis in dairy cattle. However, it is not known if the measures of subcutaneous obesity that reflect BCS in dairy cattle can be correlated with changes in visceral obesity, which is considered to be a major source of TNF-alpha in obese humans. This is the first report relating both high BCS and oxidant stress with the increased expression of TNF-alpha in dairy cattle. Further studies are needed to establish the underlying pathways in this relationship.

Quantification of Lactation Curves for Diagnosis

J. Ehrlich, *DVM*
Dairy Veterinarians Group, Argyle, NY

Introduction

Milk production over time (the lactation curve) is both a reflection of the health of a lactating cow and the most important economic measure of her performance. MilkBot™ is a tool to quantify both the shape and magnitude of lactation curves in a consistent and repeatable way. These fitted curves, and the parameter values which define them, provide a quantitative measure of essential differences which exist between individual lactations. This paper describes a new tool set available to researchers and bovine practitioners, with a few examples of early applications.

Materials and Methods

We begin by devising a theoretical-mechanistic model for lactation. This is pseudo-physiology, meaning we use physiological reasoning without worrying whether all our assumptions are exactly correct. The point is more to have a clear chain of logic in the derivation of the model than to model actual physiology. A simple, defined derivation makes it easier to interpret results.

The four-parameter, non-linear model we derive is then fitted to observed lactation data by a sophisticated computerized fitting engine. Parameters (and reduced parameters) can then be studied using traditional statistical techniques or a specialized tool set for exploratory data analysis.

Results

There is a great deal of variability between and within lactation curves in commercial dairies. MilkBot™ quantifies this variability so that it can be studied systematically. For example, MilkBot™ quantifies

Significance

Milk production over time is an extremely sensitive measure of bovine health. The average normal shape of lactation curves is known, but there has been little quantitative research on variability in lactation curves because of the difficulty of quantifying those differences in a consistent and valid way. MilkBot™ offers a new and powerful tool set for analyzing milk production.

Acknowledgement

MilkBot™ includes proprietary technology in which the author of this paper has a personal financial interest. MilkBot™ is a trademark of DairySight LLC, Argyle, NY.