

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

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### 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 sta-

tistical 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.

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