

Efficacy of Formic Acid as a Means of Controlling *Mycoplasma bovis* and *Mycobacterium avium* subspecies *paratuberculosis* in Dairy Cattle

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Introduction

Adequate colostrum transfer of immunoglobulins is critical to the health of the dairy calf. However, colostrum and waste milk can also serve as an efficient mode of transmission for pathogens including *Mycoplasma* spp and *Mycobacterium avium* subsp *paratuberculosis*, the causative agent for Johne's disease. Pasteurization and colostrum substitutes are successful means of eliminating this threat, but are cost-restrictive for many smaller dairy producers. There is a critical need for an alternative method to prevent the transmission of these diseases while maintaining adequate passive transfer of immunoglobulins. This study examines the use of acidification of colostrum and waste milk using formic acid as a control system for these pathogens while maintaining the integrity of the immunoglobulins.

Materials and Methods

In the first set of experiments, the effect of pH and time duration needed to kill *Mycoplasma bovis* and *Mycobacterium avium* subsp *paratuberculosis* will be determined. Pasteurized colostrum and milk will be inoculated with one of the study organisms to a concentration of approximately 10^8 CFU/ml and 10^3 CFU/ml for *Mycoplasma bovis* and *Mycobacterium avium* subsp *paratuberculosis*, respectively. The milk will be acidified to one of four pH points and will be held at room temperature and samples taken at time points over the next 48 hours. Bacteria will be enumerated by standard plate dilution methods for both pathogens and, additionally, the TREK liquid culture system for *Mycobacterium avium* subsp *paratuberculosis*. The second portion of the project is designed to determine the effect of acidification on immunoglobulin absorption and activity. Fresh bovine colostrum will be pooled to provide a homogeneous colostrum sample that will be used for all calves. Half of

the colostrum will be acidified and half will be untreated. The colostrum will be fed to 20 newborn bull calves which will each receive two meals of two quarts within 12 hours of birth. Ten calves will receive acidified colostrum and 10 calves will receive untreated colostrum. Blood will be collected before feeding and at 24 hours of age to evaluate the efficacy of passive transfer.

Results

These studies are currently in progress and no results have been obtained at the time of this abstract submission. We hypothesize that the acidification of colostrum and milk will render *Mycoplasma bovis* and *Mycobacterium avium* subsp *paratuberculosis* non-viable while maintaining the ability to provide passive transfer of functional immunoglobulins.

Significance

Colostrum immunoglobulins are critical to maintaining the health of dairy calves, however, colostrum and milk also represent a potential means for disease transmission. *Mycoplasma* spp and *Mycobacterium avium* subsp *paratuberculosis* cause chronic infections transmitted through colostrum and milk that can affect productivity throughout the life of the neonatally-infected cow. Pasteurization and colostrum substitutes decrease this risk but are often cost-prohibitive for a smaller dairy producer. Formic acid acidification may represent an efficient and cost-effective method of maintaining immunoglobulin integrity while preventing transmission of *Mycoplasma* spp and *Mycobacterium avium* subsp *paratuberculosis* from the dam to the calf. Use of this technique may decrease the transmission of bacterial pathogens, neonatal calf disease and mortality while increasing the well-being of the calves, biosecurity and productivity.