

PRACTICAL MONITORING OF CLINICAL MASTITIS TREATMENT PROGRAMS

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Introduction

As herd veterinarians and consultants, it had become increasingly important that we “ask the cows” how our management is doing by monitoring herd health and production data. Mastitis treatment efficacy is a classic example. In many instances whatever was in the last intramammary tube that was infused gets credit for the “cure”. Relying on the herds person’s or sickpen crew member’s perception of “how well” a particular treatment is working can be misleading. Often the more recent, more severe, “treatment failures” remain prominent in their mind. We eliminate these biases by developing rational treatment protocols, adhering to them and setting up a method for accurate and complete on farm data capture and recording. With these elements in place we greatly increase our ability to more objectively monitor the success of our clinical mastitis treatment programs.

The need for treatment of clinical mastitis is to some degree an indication of failure of our Udder Health Management Program (UHMP) to minimize exposure to mastitis pathogens and optimize resistance of the cows. This discussion assumes a UHMP is in place which includes: routine bulk tank milk culturing and bulk tank SCC monitoring, routine mastitis pathogen profiling or individual mastitis episode milk culturing, cow and bedding cleanliness, excellent milking parlor procedures. This allows for development of rational, standardized treatment protocols when clinical mastitis does occur. The purpose of this paper is to provide some tools for practical monitoring of established clinical mastitis treatment programs. These techniques can be applied equally well to smaller herds with hand written records as well as herds using herd management software. Examples used in this paper are from a herd using Dairy COMP 305™ (Valley Agricultural Software, Tulare, CA), however, the concepts apply broadly.

Data Capture and Recording

Complete, accurate and reliable records are the foundation of any monitoring program. Often we find producer’s records contain insufficient data for us to provide them with the information they desire. Or the data is there but requires hours of tedious manipulation and clean-up prior to interpretation. This results in reactive modification of data capture and recording methods and a delay in our ability to provide the producer with useful information. The following guidelines may help to develop a dataset from which useful information for monitoring can be extracted:

1. Determine *a priori* how you will query the dataset (i.e. What questions do we want to ask. This will guide you as to what data is needed and how it should be collected and recorded to make the job of evaluation easier and more efficient. This is the first and most important step in practical monitoring of any health event. Questions of interest include:
 - What is the monthly incidence of clinical mastitis?

- How many clinical mastitis episodes require re-treatment? What treatments require that a cow be re-treated? This should further be evaluated by bacterial pathogen (culture result).
 - How many cows have more than one mastitis episode in the current lactation?
 - How many cows have recurrent clinical mastitis episodes (multiple clinical mastitis episodes in the same quarter > 14 days apart)?
 - How long are cows with clinical mastitis in sick pen or how long is it necessary to dump their milk?
 - How many cows die or are culled due to clinical mastitis?
2. Develop practical data capture systems. It is very important to develop a data capture method that is easy and convenient and thus likely to be used. Use of sick cow treatment cards allows for easy recording of daily treatment details such as dosage, route and duration. Subsequently, data pertinent to the monitoring program can be transferred to the herd management software or written herd summary worksheet. Data entered as health event remarks into herd management software programs should be limited to allow ease of sorting.
 3. Develop data entry protocols that ensure accurate, consistent and reliable data recording.
 - As a general rule anything that happens to all animals at set times does not need to be recorded in herd management software. Examples include routine vaccinations and giving magnets. Furthermore, unless you are interested in monitoring outcomes of such treatments, supportive care (fluids, anti-inflammatories, etc) need not be recorded in events remarks. They should be available on individual cow treatment cards if needed.
 - Avoid redundancy of health event data. Many producers using herd management software enter multiple health events for a single clinical episode. For example a cow is identified with clinical mastitis and a MAST event is entered in her record. She fails to cure following initial treatment, a new treatment is started and she receives another MAST event. Thus one cow with a single clinical mastitis episode would have 2 MAST events recorded resulting in inaccurate monthly tallies and health event lists provided by the software. If treatment is changed or the cow flares up in the same quarter within 14 days the cow should receive a different event that can easily be tallied as an indication of treatment failure (ex. A separate REMAST event with a remark that includes quarter and treatment).

Data to record for monitoring clinical mastitis treatment protocols:

- Quarter(s) affected during a clinical mastitis episode allows for identification of recurrent mastitis episodes.
- CULTURE – Culture result from a clinical mastitis episode (if available) allows evaluation of treatment efficacy based on pathogen type. Record culture result and quarter(s) sampled. For example, culture result is environmental streptococci in the LR quarter (Remark= ENS LR).
- Treatment – Intramammary (IMM) antibiotic and or systemic antibiotic used. For example, IMM amoxicillin once a day for 3 days (Remark= AM3S, where the ‘S’ indicates once a day) or IMM cephalixin twice a day for 5 days (Remark= CF5B, where the ‘B’ indicates twice a day). If treatment is changed or cow becomes clinical again

within 14 days a REMAST event should be recorded, with quarter and treatment information in the remark to monitor retreatments.

- Hospital pen days or Days of milk discard. This parameter is often the best way to evaluate days to clinical cure which is not typically recorded on farm. It is important to realize this parameter includes antibiotic withdrawal time and is typically an overestimation of days to clinical cure. This can be calculated manually from pen MOVE events on either side of a MAST event or using a separate hospital pen (HOSP) event.
- Cow with a dry quarter. For all cows in which it is elected to kill a quarter an event (3TEAT) should be recorded with a remark indicating the quarter (Ex. LR) that was killed and the treatment applied (Ex. NL-Nolvasan, BD-Betadine, AMP-Amputate). Recording this event will allow easy tallying of cow requiring quarter killing monthly and annually. If it is elected to kill a quarter when a cow presents for a new mastitis episode (usually due to repeated episodes) a MAST event should be recorded with a remark indicating quarter and treatment. If it is elected to kill a quarter after initial treatment has failed a REMAST event should be recorded with a remark indicating quarter and treatment. This will allow easy tallying of treatment failures that resulted in quarter killing.
- Death and culling due to mastitis. When death (DIED) and culling (SOLD) events are recorded it is important to include the reason in the remark in such a way that they can easily be sorted. For example in Dairy COMP 305™ include the event code in the SOLD or DIED remark (SOLD 38, where 38 is the event code for mastitis).
- Individual cow somatic cell count (SCC) if available. Many larger herds have limited (quarterly) or no individual cow SCC data. Use of SCC to identify new, chronic and resolved infections has been well described elsewhere (Seymour *et al.*, 1989; Schukken and Kremer, 1997; Cook *et al.*, 2002;).

Data Evaluation

Once excellent data capture and recording has been established it is possible to evaluate the data in order to monitor the effectiveness of clinical mastitis treatment programs. Data is typically evaluated monthly and the results recorded to allow for longitudinal evaluation (changes with time). Many herd management software programs will provide monthly and annual tallies of some of the parameters of interest. Efficiency of reporting is greatly enhanced by having as many parameters calculated automatically, however, it is often necessary to download lists of data to a file that can be opened into a spreadsheet. This allows compilation of data, sorting and calculations. Evaluation of some parameters requires manual manipulation of the data.

Establishing a herd baseline for the parameters to be monitored is critical to the evaluation of the impact of clinical mastitis treatment protocols. Furthermore, realistic goals should be established based on the economic constraints of obtaining those goals. In some instances, however, few data are currently available to define realistic goals (Schukken and Kremer, 1997).

Parameters useful in the evaluation of clinical mastitis treatment protocols include:

- Monthly Incidence of Clinical Mastitis – The number of clinical mastitis episodes for the month (MAST) divided by the number of cows in milk. (Dairy COMP 305™ command:

EVENTS\SI. List cows and events, select the dates of interest, select the mastitis event.) A realistic goal is less than 3 percent. This list can be downloaded into a spreadsheet and sorted by treatment or culture result for further evaluation.

- XMAST – The number of clinical mastitis episodes in current lactation. This parameter helps identify “problems cows” that should be evaluated for possible teat end damage, quarter killing or culling. This can be evaluated as the percentage of lactating cows with XMAST >1 in a month or as the percentage of cows with a clinical mastitis episode with XMAST >1 in a month. Increases in this parameter may reflect environmental conditions, contagious mastitis spread, poor teat end condition or decreased treatment efficacy.
- CULTURE – Culture results should be evaluated at least monthly to determine the mastitis pathogens responsible for clinical mastitis. (Dairy COMP 305™ command: EVENTS\SI. List cows and events, select the dates of interest, select the culture event.) This list can be downloaded into a spreadsheet and combined with the associated mastitis event for further evaluation.
- XREMAST – Number of retreats – Defined as the number of clinical mastitis episodes requiring more than first course of therapy or that relapse within 14 days of the initial episode. (Dairy COMP 305™ command: EVENTS\SI. List cows and events, select the dates of interest, select the event that indicates re-treatment (REMAST).) This list can be downloaded into a spreadsheet and combined with the associated mastitis event for further evaluation. This parameter indicates treatment failure and should be evaluated by culture result and treatment. Culture results are critical for accurate evaluation of the number of retreats. Low bulk tank SCC herds, with a low prevalence of contagious mastitis pathogen infections typically have a high incidence of clinical mastitis caused by coliform pathogens (Erskine *et al.* 1988; Green and Bradley, 1998). These herds can have a high re-treatment rate since commercial intramammary antibiotic preparations have limited to no Gram negative spectrum. A realistic goal is less than 20 percent re-treatment rate. If the re-treatment rate is high, consider the proportion of clinical mastitis episodes caused by coliforms. Evaluating re-treatment for Gram positive clinical episodes is important in evaluating efficacy of IMM antibiotic treatment.
- XRECURS – Number of cows with more than one clinical mastitis episode occurring in the same quarter (>14 days apart) in the last three months of the current lactation. So, in February one would evaluate recurrent episodes in cows having their first mastitis episode in October. (Dairy COMP 305™ instructions: Create or find an item for the date of the first mastitis event (e.g. FMAST). EVENTS for XMAST>0 FMAST=(enter date range of interest, e.g. 10.1.03-10.31.03)I. List cows and events, select the mastitis event.) One can then manually count multiple cases in the same quarter > 14 days apart. This parameter reflects a lack of bacteriologic cure (persistent infection) and/or possible teat end damage rendering the quarter more susceptible to intramammary infection. This parameter should be evaluated by culture result and treatment. A study by Bradley and Green (2001) found 24% of clinical *E. coli* mastitis cases occurred in quarters experiencing two or more cases of clinical *E. coli* mastitis. In 85% of recurrent *E. coli* cases DNA fingerprinting indicated the clinical episodes were caused by the same genotype suggesting persistent infection. In all recurrent cases clinical signs were limited to the gland. Similarly, we typically find recurrent coliform clinical episodes are mild (exhibit no systemic signs). Evaluation of this parameter based on culture result allows

one to discern what proportion of recurrent clinical episodes are due to coliforms in which IMM treatment is unlikely to be effective vs. Gram positive pathogens suggesting a change in treatment protocol is needed. A goal of less than 5% recurrent Gram positive clinical mastitis episodes is realistic. A high rate of recurrent coliform clinical mastitis episodes appears to be an increasing problem. Studies are needed to establish effective coliform mastitis treatment protocols that eliminate these persistent infections. Until then our focus needs to be on reducing the rate of coliform IMI, especially those acquired during the dry period (Todhunter, D. A., *et al.* 1991; Bradley and Green, 2000).

- Average hospital pen or milk discard days. This should be evaluated based on culture result and treatment. This value is useful in cohort studies between different treatment protocols (e.g. amoxicillin vs. pirlimycin, IMI treatment vs. no treatment of clinical coliform episodes). (Dairy COMP 305™ instructions: Create or find an item for the date of the last mastitis event (e.g. DMAST). EVENTS for XMAST>0 DMAST=(enter date range of interest, e.g. 10.1.03-10.31.03)\I. List cows and events, select the MOVE and or hospital pen and mastitis event.) This list can be downloaded into a spreadsheet for calculation or combining with culture data.
- X3TEAT – Number of cows that had a quarter killed in a month. Calculate the percent cows with clinical mastitis in the month that resulted in quarter killing. (Dairy COMP 305™ command: EVENTS\SI. List cows and events, select the dates of interest, select the 3TEAT event.) This is a measure of clear treatment failure or “giving up”. An established goal is not readily available, however, it is important to monitor this value on a monthly basis and watch for increases suggesting lack of treatment efficacy. Less than 3% of the entire herd should be 3TEAT cows.
- Percent DIED or SOLD for mastitis. (Dairy COMP 305™ command: EVENTS\SI. List cows and events, select the dates of interest, select the SOLD and DIED events, select optional REM pattern indicating mastitis.) A reasonable goal is < 6% of clinical mastitis episodes resulting in death or culling.

Monthly monitoring of these parameters provides information about the effectiveness of established clinical mastitis treatment programs and can signal when a change is needed. Continuous monitoring will provide objective feedback as to the success or failure of changes in clinical mastitis management.

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