Total Quality Management: AABP Clinical Mastitis Guidelines and Evaluation Records to Make Treatment Decisions

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Total Quality Management (TQM) is a relative new term on dairy farms to describe the process of work and how it is accomplished. It implies that every task has an expected level of quality that all personnel on the farm have agreed upon and accepted. Instead of the owner/manager determining goals, objectives and strategies while others are responsible for work assigned, TQM is designed to bring about cooperation of all personnel in determining goals and the work necessary to assure quality is included into the process[1]. All work has structure that can be broken down into systems with specific tasks to be accomplished by personnel on the farm. The first step is to establish herd goals and to be sure everyone (owner(s), manager(s), worker(s)) agree on these goals and are committed to the work necessary to achieve them. When everyone has agreed to the goals it is equally important that all are involved in the decision of objectives and strategies necessary to implement the task to get the job accomplished and meet the "quality principles".[2]

How work is done and who is responsible is crucial for good results. The TQM concept organizes work into systems, processes and tasks so that everyone knows what must be done and who is responsible. A dairy operation can be broken down into a number of systems: heifer raising, reproduction, milking cow and nutrition, etc. These may be broken down differently for each farm and to different levels depending on farm's goals, problems and operations.

This paper addresses the problem, therefore, the system: Clinical Mastitis Management. Like other systems, you must first identify personnel involvement, the process and the task which must include the documentation and feedback (Figure 4).

The Dairy Quality Assurance Program has been organized so that it fits easily into TQM in that the goals, farm plans and records employed in the 10-CCP program meets many of the TQM requirements. TQM takes the next step by including veterinarians as the Quality Consultant to work with the owner/manager and staff to develop a Systems approach to handle clinical mastitis. The AABP mastitis committee has developed guidelines for therapy of clinical mastitis and a set of records for evaluating clinical mastitis. The AABP Daily Treatment Records has become the focus of the Milk and Dairy Beef Quality Assurance Producer Renewal Manual[a]. The Renewal Manual is aimed at developing treatment protocols and recording treatments, withholding times and identify testing. It is the use of the Renewal Manual's drug inventory, treatment protocol and treatment records that provides information for goal setting and clinical mastitis evaluation.

Guidelines for Therapy of Clinical Mastitis in Lactating Dairy Cows[3]

The immediate goal of the producer is to return the quarter and the milk to normal.

Secondary goals are to eliminate mastitis-causing organisms from the quarter, to prevent further damage to the milk-secreting tissue, to help sustain future milk production by the cow, and to lower the somatic cell count (SCC). This must be done in a cost-effective manner, without causing drug residues in milk or meat. The role of the veterinarian is to design rational treatment protocols that help cows recover, help the owner's bottom line, and protect the consumer from drug residues. *Most clinical mastitis (CM) is treated by dairy producers or their employees.*

Treatment protocols for use by non-veterinarians must be based on products labeled for therapy of clini-

[a] *Milk and Dairy Beef Residue Prevention Protocol, 1995 Producer Renewal Manual, published by Agri-Education Inc. Stratford IA.*

System: Clinical Mastitis Treatment and Evaluation

Personnel: owner, herdsman, milker

Process:

1. Premilking Examination	2. Clinical Mastitis Identification	3. Treatment Protocol	4. Records	5. Evaluation & Review
1.1 Examine milk & udder. Check for abnormal milk, swelling, pain and tempature.	2.1 Identify cow, quarter and pen location.	3.1 Mild (no Strep ag) Frequent, complete milkout with aid of oxytocin.	4.1 Record CM on AABP CME sheet; cow ID, event date, DIM, production.	5.1 Goals: Acute; <1% ill in herd New cases; <2%/mo Cases herd; <50 cases/ 100cows/year
1.2 Collect aseptic milk sample for culture.	2.2 Stage of lactation, milk production and reproduction status.	3.2 Intermediate CM Intramammary antibiotic, or in combination with systemic antibiotics.	4.2 Diagniosis: clinical signs for severity.	5.2 Type of CM based on culture data; contagious or environmental.
	2.3 Move cow to sick pen, or ID cow to milk last.	3.3 Severe (depress/off-feed); supportive therapy, fluids, anti-inflammatory drugs and frequent milkout. Veterinary intervention if not responding.	4.3 All treatments, milk and meat withholding.	5.2 Calclulate milk loss and CM cost.
	2.4 Determine severity of mastitis: severe, mild intermediate, or contagious CM.		4.4 Testing: type, date and results.	5.3 Review therapy protocol base on records.
			4.5 Milk return to tank. Record days and milk loss.	5.4 Review prevention program; premilking procedures, enviro-mental conditions and milk practices.

Figure 4. Total Quality Management approach to handling Clinical Mastits (CM) on dairies.

cal mastitis. Treatments using extra-label drugs should only be recommended when no approved alternatives exist, or when the veterinarian can document that the available approved drugs are ineffective.

Mastitis management must focus on prevention.

Therapy of CM should be part of an udder health program that includes milking hygiene, management of the cows' environment, milking equipment evaluation and maintenance, evaluation of milking technique, appropriate immunizations, and a culling protocol.

The veterinarian's recommendations for therapy must be based on knowledge of the likely etiology for each herd, based on recent culture results. Severity of clinical signs and the appearance of the milk are not reliable evidence of etiology.

Coliform mastitis, for example, can be mild and chronic or peracute and severe. Therapy of a given cow must begin before her culture results can be known. However, a treatment protocol can be designed based on the known pattern of pathogens involved in the etiology of CM on the farm. This may be done by culturing pretreatment milk samples from cows with CM or high SCC. Bulk tank milk microbiology is of value when *Streptococcus agalactiae, Staphylococcus aureus*, or *Mycoplasma* sp. are present, but not for the diagnosis of CM caused by environmental pathogens. Antibiotic susceptibility testing should not be done on bulk tank or pooled milk samples. The relationship between antibiotic susceptibility testing of isolates from CM cases and outcome of therapy has not been established.

Good records are a prerequisite for an effective CM therapy program and are needed to document residue prevention efforts.

It is especially useful to know the cow's past history of mastitis problems. The AABP Mastitis Committee has designed a set of forms for on-farm use, suitable for copying and distribution by veterinarians. These are available from the Milk and Dairy Beef Quality Assurance Program and The Upjohn Company.

Treatment should only be undertaken if it is likely to be profitable.

The profitability of therapy depends on the likely etiologic agent, the cow's age, past mastitis history, past production history, past success of available treatments, stage of lactation, state of pregnancy, value of the cow as a cull, price and availability of replacement animals,

other medical problems, and goals of the owner. Clearly there is no point in treating an old open cow with a poor production record and an extensive history of udder problems. Treatment of a healthy young cow in early lactation with no prior mastitis history is more likely to have a profitable outcome.

Hopeless cases should not be treated.

Mastitis caused by *Mycoplasma* sp., *Serratia* sp., *Pseudomonas* sp., *Actinomyces* sp., *Nocardia* sp., *Prototheca* sp., *Mycobacterium* sp., yeasts, fungi, and most other unusual pathogens is refractory to all known therapy. Mastitis caused by *Staphylococcus aureus* is refractory to treatment in most cows.

A protocol is needed for cows that repeatedly get CM.

Treatments that have been shown to be ineffective need not be repeated. After three or four episodes these cows should either be allowed to recover without treatment, be sold, or the affected quarter dried off. In many herds a large proportion of the discarded milk results from mastitis in a few repeat offenders.

Untested combinations of extra-label products should not be formulated.

There is no scientific evidence for their efficacy and safety, withdrawal times are generally unknown, and their formulation for sale is illegal. Multidose containers should never be used because of the risk of contamination with resistant organisms such as *Mycoplasma* and yeast.

Antibiotics are unlikely to be of benefit in CM caused by gram-negative organisms.

Frequent, thorough milkout with supportive therapy, possibly including anti-inflammatory drugs, should be the basis of treatment. Severely ill cows may benefit from systemic antibiotics to protect against secondary infections.

Clinical mastitis should be classified according to severity.

Severe mastitis, where the cow is depressed and off feed, should be treated with supportive therapy aimed at counteracting the effects of endotoxin through the use of treatments such as fluids, calcium, hypertonic saline, anti-inflammatory drugs, and complete and frequent milkout of the affected quarter(s). Studies have shown that antibiotics make little difference in the outcome of severe coliform mastitis. Intramammary antibiotics are poorly distributed in a severely swollen gland. Successful treatment of these cows may require veterinary intervention and should at least follow a protocol established in consultation with the herd veterinarian.

Clinical mastitis caused by *Streptococcus agalactiae* should be treated with approved intramammary antibiotics. Clinical mastitis caused by *Staphylococcus aureus* can be treated with intramammary antibiotics to reduce clinical signs, but few cows will be cured during lactation.

Mild CM in herds with no history of mastitis caused by *S. agalactiae* may be allowed to recover with no antibiotic therapy, relying only on complete milkout, perhaps with the aid of oxytocin injections. Increased milking frequency is desirable.

Intermediate cases caused by gram-positive organisms may benefit from intramammary antibiotics or a combination of intramammary and systemic antibiotics. Antibiotics approved for systemic use in lactating cows may not cross the blood-milk barrier in therapeutic concentrations. Anti-inflammatory therapy may be used to reduce udder swelling and help cows feel better.

Even in the absence of definitive data regarding the efficacy of therapy for clinical mastitis, veterinarians can help their clients design rational treatment protocols that limit antibiotic use to the cases that are most likely to benefit from them.

Use of Records

In two separate surveys of dairy herds to identify high risk area for residue violations, the most common deficiency was a failure to maintain written records of treated animals, drugs used and milk withholding times. The AABP Daily Treatment Records[b] was designed to meet dairy producers needs in tracking treated animals to reduce the error of selling milk or meat with violative residues. There are three records which are necessary to account for the use and effectiveness of drugs in clinical mastitis on a dairy: drug inventory, daily treatment records, clinical mastitis evaluation record.

Drug Inventory Records

Drug inventory records are generally absent and neglected on most dairy farms. Most dairies try to keep track of drug use by maintaining drugs in the location as designated by the PMO. Limiting the number of vendors for drugs and biological purchases and keeping written records of these transactions will help account for drugs used on the farm. In herds where drug inventories are maintained, more thoughtful decisions are made on disease treatment. Inventory records are often the weakest link in most drug control systems.

The drug inventory record should identify the date

[b]*Clinical Mastitis Evaluation & Treatment Record, 1992, developed by mastitis committee, AABP, distributed by The Upjohn Company, Kalmazoo MI.*

Milk & Dairy Beef Quality Assurance Program

Record of Drug Purchases

Drug Purchased	Date Purchased	Where Purchased	Amount Purchased	Purpose	Notes
Oxytocin	5-1-95	Vet	100cc	Let down	
Pen G	5-4-95	Farm Store	100 cc	Calves	
CefLak	5-5-95	Vet	24	Mastitis	
Quarter Master	5-5-95	Vet	24	Dry Cow	

Figure 1. Record of Drug Purchases

the drugs are purchased; type of drug: over-the-counter (OTC), prescription (Rx), or extra-label use (ELU); decision for use; proper screening test; and type of animal and disease conditions for their intended use. Inventories should be designed to account for drugs entering the farm and record their use. An inventory list used together with the treatment record can be used to track drugs on most farms.

Treatment Records

There are many different types of treatment records which can be used ranging from inexpensive cow cards or notebook records to highly specialized computerized records that provide rapid drug use summaries and analysis. The best record is one that is kept and used to assess treatment strategies and avoid residues. The AABP Mastitis Committee has produced two records forms currently used and working well on dairies.

Daily Treatment Record: The daily treatment record can be used as a simplified barn sheet for identifying treated animals which can be transferred or maintained as a permanent drug use record (Figures 2 & 6). The top of the record sheet is designed to provide an abbreviated Treatment Protocol. It is difficult to develop a generalized treatment plan that can be used successfully on all dairies. The type and level of disease differs for each herd, as well as the knowledge and skills of the producer. Some producers must be instructed specifically as to the directions for treating a disease condition in a cow, while other producers have the education and skills to handle diagnosis and make informed decisions on therapy. Therefore, a specific treatment protocol based on the producer capability and designed around clinical symptoms should be developed individually between the veterinarian and the producer (Figure 5). However, to assure responsible drug usage and residue avoidance, a farm-specific treatment plan

DAILY TREATMENT RECORD

Developed by American Association of Bovine Practitioners
Sponsored by ***The Upjohn Company***

ANYBODY VETERINARY CLINIC
123 WEST PLAIN ST.
NOWHERE, U.S.A.

HERD: John Dairyman TIME PERIOD: Dec 1992

TREATMENT CODE				
BRAND NAME	DOSE	ROUTE OF ADMINISTRATION	WITHDRAWAL	
			MILK (hrs)	MEAT (days)
1 Albacillin	Tube	Imm	96	4
2				

COW ID	TREATMENT				PEN	DIAGNOSIS	TREATMENT	WITHDRAWAL TIME		DATE, TIME MILK OK TO SELL	DATE IN TANK	RESIDUE TEST		REMARKS (for example: initials of person treating or testing)
	DATE	AM	PM	3X				MILK (hrs)	MEAT (days)			DATE TESTED	TEST RESULTS	
125	12-7	✓				LF ✗ nr / LR nn	#1	96	4	12-11 pm	12-11	12-11 am	Delvo P Neg	JK
230	12-7		✓			LF nr / LR ✗ nn	#1	96	4	12-12 am	12-12	12-11 pm	Delvo P Neg	JK
354	12-10		✓			LF nr / LR ✗ nn	#1	96	4	12-15 am	12-15	12-11 pm	Delvo P Neg	JK
						LF nr / LR nn								

Figure 2. Daily Treatment Record

Developed by American Association of Bovine Practitioners
Sponsored by ***The Upjohn Company***

ANYBODY VETERINARY CLINIC
123 WEST PLAIN ST.
NOWHERE, U.S.A.

CLINICAL MASTITIS EVALUATION

FARM NAME: John Dairyman TIME PERIOD: Dec. 1992

COW ID/ QUARTER	LACTATION NUMBER			CALVING DATE	DATE, TIME OF CLINICAL MASTITIS TREATMENT	DIM	CLINICAL MASTITIS BY STAGE OF LACTATION				PEN	# CLINICAL OCCURRENCES		REMARKS (CULTURE OR RESIDUE TEST)
	1	2	3+				<10 DIM	10-100 DIM	100-200 DIM	200+ DIM		Per Cow	Per Quarter	
125	✓			11-26	12-07 Am	11		✓			1	1	1	Cong Neg Staph
230		✓		11-29	12-07 Pm	7	✓				2	1	1	Non-Ag Strep
345			✓	8-30	12-10 pm	101			✓		2	3	3	Non-Ag Strep

Figure 3.

should be created for each farm and maintained in a record system (i.e. drug use notebook) where all workers on a farm can refer. A treatment plan should include the person(s) making the diagnosis, treatment decisions, person(s) responsible for treatment, drugs for use, withholding time for milk and meat, and means to assess treatment results. The degree to which the veterinarian is directly involved in each of the steps will determine the specifics required in the written plan.

Clinical Mastitis Evaluation: The Clinical Mastitis Evaluation Record form can be used to tally the epidemiologic and economic analysis of the herd clinical mastitis (Figure 3 & 7). The use of this record requires the transfer of individual information from the Individual Cow Drug Treatment Record. However, compilation of the clinical mastitis data will help to characterize the herd clinical mastitis problem as well as estimate its economic magnitude. Using this information, specific cost effective clinical mastitis control recommendations can be made.

It is important that goals and plans are developed if the Dairy Quality Assurance Program is going to be implemented. After you work with your client and have developed the goals and plans for the farm, the records and activities should be routinely evaluated. Routine herd visits provide an excellent opportunity to discuss the farm's progress. If records are not being used or the treatment plan not adhered to, then it is likely that the goals and plans were not that of the producer. These plans should be discussed with the producer as to their needs and what they are willing to do. *Only when the goals and plans become that of the producer are they likely to be implemented.*

References

1. Fuhrmann, T. 1995. The Quest for Quality in the Dairy Industry. *Proc. 34th Annual National Mastitis Council.* pp3-10. 2. Fuhrmann, T. 1995. The Quality-Minded Dairy Practitioner. *Bovine Proc.* pp38-39. 3. AABP Mastitis Committee. 1994. Guidelines for therapy of clinical mastitis in lactating dairy cows. *AABP Newsletter*, p4.

Treatment Protocols

Protocol Number	Condition Treated and Signs	General Treatment Plan			Withholding		Appropriate Antibiotic Screening Test
		Antibiotic or Drug Used	Dose and Route	Length of Treatment	Milk (hrs)	Meat (days)	
1							
2							
3							
4							
5							
6							
7							

Figure 5.

Figure 6.

DAILY TREATMENT RECORD

Developed by: *American Association of Bovine Practitioners*
Sponsored by: *The Upjohn Company*

HERD: _____ **TIME PERIOD:** _____

TREATMENT CODE				
BRAND NAME	DOSE	ROUTE OF ADMINISTRATION	WITHDRAWAL	
			MILK (hrs)	MEAT (days)
1				
2				
3				
4				
5				
6				

COW ID	TREATMENT TIME				PEN	DIAGNOSIS	TREATMENT USED	WITHDRAWAL TIME		DATE, TIME MILK OK TO SELL	DATE IN TANK	RESIDUE TEST		REMARKS (for example: inititals of person treating or testing)
	DATE	AM	PM	3X				MILK (hrs)	MEAT (days)			DATE TESTED	TEST RESULTS	
						LF RF LR RR								
						LF RF LR RR								
						LF RF LR RR								
						LF RF LR RR								
						LF RF LR RR								
						LF RF LR RR								
						LF RF LR RR								
						LF RF LR RR								

Figure 7.

Developed by: American Association of Bovine Practitioners
Sponsored by: The Upjohn Company

CLINICAL MASTITIS EVALUATION

FARM NAME:_____ TIME PERIOD:_____

COW ID	DATE OF CLINICAL MASTITIS	QUARTER(S)	TREATMENT/ DRUG(S) USED	DOSE, ROUTE, TIME (AM/PM)	DAYS TREATED	DATE & TIME MILK OK TO SELL	DAYS MILK WITHHELD	REMARKS (INITIALS, CULL, DEATH OR RESIDUE TEST)

CLINICAL MASTITIS COST ESTIMATE PER TIME PERIOD	
TREATMENT COST	
MILK LOSS	
CULL LOSS	
DEATH LOSS	
OTHER	
TOTAL	

TOTAL DAYS TREATMENT = _____

x _____

AVG TRT COST

TOTAL DAYS WITHHELD = _____

x _____ AVG MILK COW

_____ LB MILK LOSS

x _____ MILK PRICE

$ _____ MILK LOSS