Herd Mastitis Investigation Report

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Introduction

On Thursday, June 9, 1988, a farm visit was made at the request of the local veterinarian to investigate a herd mastitis problem. The primary concern was an increased incidence of clinical cases of mastitis and high bulk tank somatic cell counts over the past 6-12 months.

Herd Characteristics:

The dairy herd consists of 33 grade Holstein cows. The herd average per cow for the month of May was 62 lbs of milk with a 3.21% fat test. The herd is not DHI. The barn is a double row of face out tie-stalls with a center walk alley.

Stray Voltage:

In Nov. 1987, the owner detected a 2½-9 volts on the neutral line entering the barn. The owner called the electrical utility, City of Cow City, to investigate. The utility found the stray voltage to be an off-farm source and installed an isolater on the farm transformer pole in April, 1988. Numerous ground rods were also placed on the farmstead. During our visit stray voltage was measured using a continuous voltage recorder and a hand held voltmeter. The continuous voltage recorder was placed on the barn secondary neutral. From 4:10 pm until 8:30 pm the continuous voltage recorder never went above 0.25 volts. Both the hand-held voltmeter and the continuous voltage recorder were grounded to a metal stake driven 18 inches into the ground about 25 feet from the barn. Several locations in the barn were measured with the hand-held voltmeter. The results are as follows:

	AC Volts (500 ohm resistor) 6:30 pm
Drinking Cup	0.01 Volts
Pipeline	0.01 Volts
Waterpipes	0.00 Volts
Milkhouse;	
Bulktank	0.03 Volts
Milk jar pump	0.03 Volts
Floor drain	0.00 Volts
Ground from Utility Line	0.04 Volts

Since the difference between contact points was not greater than 0.5 V, stray voltage was not considered a problem at this time.

Milking Machine System:

The milking system was a Delaval 2 inch stainless steel pipeline system. The milk line was a complete loop around the barn. The milk house was on the northwest corner of the barn. The high point of the pipeline was the southeast corner. The slope of the milkline was fine except for the last 15 feet on the west end of the south milkline where there was a reverse slope of ¾ inch per 10 feet and a rubber connection. The proper slope should be 1½ inches per 10 feet. It prevents proper drainage and washing of the pipeline. The pulsation line was a 2″ PVC pipe in a complete loop paralleling the milkline in the barn but a single line off the loop to the milk house and vacuum pump. Four milking units were used, two per slope. Each unit had dual alternating side-to-side pulsation. The vacuum pump was a 5 HP Vac Qmer water turbine (runs with water seal, not an oil seal) with two reserve tanks (one cast iron under the pump and one stainless tank).

We were unable to measure the direct vacuum pump capacity. Two regulators were on the system; one weight loaded regulator and one Delaval 2-50 cfm diaphragm regulator. Both were located on vacuum line exiting the vacuum reserve tank. The operating vacuum level was 14.5″ Hg on both the farm gauge and the test gauge. The milk receiver jar had two entries, one for each slope of the milk-line. One entry had a half diameter milk/wash plug. The vacuum reserve capacity of this system was 64 cfm NZ. This should be 20 cfm NZ per unit or in this system 80 cfm NZ. Reduced vacuum capacity may cause increased milking time per cow and greater fluctuations in vacuum when units are changed. Vacuum capacity measured with the four pulsators operating was 53 cfm NZ (residual capacity). System recovery time was 12 sec. This should be less than 3 sec. Air bubbles were noticed in glass milk receiver lines suggesting leaks at some pipe junctions. The pulsators were DeLaval 300. All four units pulsators were operating adequately at 50:50 milking to resting ratio and at a rate of 50 pulsations per minute. Air hoses on units #1, #2, and #3 were cracked. Liners were in good shape and changed every 60-65 days which is <1200 milkings per liner. The outside of the liners, shells, and hoses needed cleaning. The milk receiver jar was observed, and milk flowed evenly into the jar.

Environment

The cows spend most of the day out on pasture. The

pasture and barnyard appeared dry except for a pile of manure under the barn cleaner and the area around the water tank. The tie stalls in the barn were of adequate size with water cups facing the manger. The stalls appeared dry but had some manure buildup on the back of the stall. Calves, heifers, and a Hereford bull run with the cows. A pen in southwest corner had about 1 foot of manure buildup. The northwest corner of barn contained numerous paper and other scattered items. Many flies were observed in barn and around manure pile under barn cleaner. Numerous electrical boxes and open wires were observed along with an uncovered main power box. A small sink in the milk house contained many syringes, bottles of medicine, and other items.

Milking Technique:

The owner milked alone both morning and night with four units, with two units per slope. Milking time was reported to be 1½ hours. Teats were washed with individual washcloths and commercial udder wash (quaternary ammonia). The washcloths were hand rinsed after each milking and reused. The washcloths appeared worn. The washwater solution was sampled after milking and grew E. coli bacteria. Washing and stimulation should be 20-30 sec. Teats were not dried but were stripped of the first streak of milk of each quarter onto the stall floor. Milking unit was applied to the cow an average of 3.8 min. after stimulation. The application of the milking unit should be in less than one minute but the increased time was due to the time needed for collecting milk samples. Units were removed after checking the cow's udder and turning off the vacuum on three of the four units. Average milking time was 8.6 min. but ranged from 5.0 min. to 13.00 min. The goal of milking time is 5-6 min. The increased milking time may have been affected by the low capacity (64 cfm N.Z.) of the system. After a few selected cows finished milking, the clusters were dipped in a separate pail with a bleach solution, all four liners at once. Teats were dipped after unit removal an average of 2.5 min. with a range of immediate dipping to 12.0 min. Teat dipping should occur immediately after unit removal. The teat dip solution was a commercial teat dip (0.5% chlorhexidine, 0.1% quaternary Ammonia). A springing heifer was teat dipped even though not yet milking. There were numerous slips and leaks of teat liners and at least four units dropped from the cows due to vacuum loss (occurred twice on one cow). Cow #17 was fresh 5 days and was milked last. Before milking #17 the milk jar and milkline were emptied and the milk/wash plugs turned to wash position, then #17 was milked into the milkline. The milk was then run down the drain.

Mammary Gland Health:

In the last 6-12 months, 20 cows were culled for mastitis described by owner as high SCC, no clumping of milk, and no swelling or lumps in udder. All cows are dry cow treated with Albadry Plus (Penicillin G Procaine and Novobiocin Sodium). The lactating cows with mastitis receive the same treatment. Cows are also vaccinated with Anchor Somato-staph vaccine (Staph aureus bacterin) every six months given by owner. All cows are teat dipped before freshening.

Milk Quality reports for the herd were obtained for the listed months as follows:

Test Date	Plate	SCC
10/ 4/87	7000	1,200,000
10/18/87	---	840,000
4/25/88		530,000
5/ 3/88	12000	435,000
6/88	----	430,000

During the evening milking, on the day of our farm visit, we ran the California Mastitis Test (CMT) and collected a milk sample from all quarters of lactating cows in the herd. This was done after each cow was prepared and before the unit was attached for milking.

A total of 33 cows and 132 quarters were tested. The CMT was scored as Negative (N), and Trace (T), 1, 2, or 3. The distribution of the number of quarters and the percentage for each score is as follows:

CMT Scores

Score	SCC	# Quarters	% Quarters
Negative	(0-200,000)	85	65
Trace	(150,000-500,000)	15	11
1	(4000,000-1,500,000)	8	6
2	(800,000-5,000,000)	11	8
3	(>5,000,000)	13	10

The quarter milk samples were refrigerated and cultured on Friday, 6/10/88, at the University of Wisconsin Veterinary Medical Regional Support Unit, UW-River Falls. Quarters were classified as infected if isolation of a significant pathogen occurred along with elevated cell count. A summary of the infected quarters and cows in the herd is as follows:

	# Quarters	% Quarters	# Cows	
Strept Nonag	1	1	1	
Strept AG	1	1	1	
Staph spp	8	6	6	(4 cows in other categories; 1 cow in 2 other categories)
Staph aureus	15	11	12	(4 cows in other categories; 1 cow in 2 other categories)
Coliforms	1	1	2	(1 cow in another
Clean	50	38	4	category)

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	# Quarters	% Quarters	# Cows
Equivocal (Culture +, CMT -	45	34	12
Equivocal (Culture -, CMT +	11	8	1
Subtotal	132		39
More than one category	0		6
Total	132	100	33

Summary

This dairy herd has a moderate level of *Staph aureus* mastitis. The most likely sources of contamination are stripping the milk onto the cow's stall and contaminated washclothes. The cow will lie down after milking and the pathogen will enter the teat canal and may infect the quarter. A strip cup would solve this. The strip cup allows you to observe the cow's milk, remove the first few streaks of milk which are high in somatic cells, and also remove the milk so it can't contaminate the cow or her herdmates. Using individual washclothes on each cow is the best situation but reusing the washclothes without laundering and drying them after each use spreads pathogens down the milking line. Teat dipping helps prevent infection of the quarter but needs to be done immediately after unit removal for maximum benefit to the cow. Just after unit removal the cow has the greatest chance for exposure to pathogens. Using the vacuum shut-off on each unit stops the unit from forcing pathogens up the teat canal as the unit is removed. This is a good practice to continue. Establishing a milking order with the infected cows milked last will decrease the risk of spreading the infection to the rest of the herd. Cows found to be infected with either *Staph aureus* or *Strept agalactiae* were cow numbers: 6, 95 red, 1,7,18,20,9,19,10,25,13,11, and 14.

Monitoring the herd for mastitis can be accomplished either by enrolling in the DHI program including the individual somatic cell option or by owner monitoring the herd by doing a monthly CMT test on each cow and assessing her progress. Both are good practices alone or done together.

The milking machines need to be kept clean and in proper working condition to maximize milking the cow and prevent milk contamination. The system needs 20 cfm NZ per unit or 80 cfm NZ total to operate properly. The system has 64 cfm NZ. Numerous leaks from milkline seals could be the problem or the pump may not be pulling out vacuum the way it should. The milk equipment dealer needs to look at the system and determine why there is low vacuum reserve capacity and repair the problem. The low vacuum reserve capacity may be part of the reason for prolonged milking times and vacuum loss during milking. The leaks and slips of the milking units should decrease with the repair of the system. The milkline has a reverse slope in it that prevents the even flow of milk to the tank. The reverse slope causes a pooling of milk, washwater, and bacteria. The milk equipment dealer needs to repair this also.

Dipping teat clusters after mastitic cows is a good practice but when all four liners are placed in the solution at once, an airlock forms and prevents rinsing. A better practice is to dip two liners in the solution at once, then the other two liners. This prevents the airlock from forming and allows the liners to be rinsed.

The milking of fresh or treated cows into the pipeline is adequate but if the milk/wash plug isn't turned or the milk receiver jar pump isn't turned off, contamination of the milk in the bulktank may occur. It would be better to attach a milkbucket to milk treated or fresh cows, this also keeps contamination of the milkline to infected cows to a minimum. Teat dipping dry cows and heifers is a good practice and should be continued.

The practice of using dry cow mastitis treatments on lactating cows should be discontinued because these formulas are specifically made for non-lactating cows. Dry cow formulas are oil based and thus remain in the cow for a longer period of time. Lactation mastitis treatments are made for short treatment periods and to limit milk residues of antibiotics when used as instructed. Dry cow treating all cows is an excellent practice.

The barn has numerous open wires and electrical boxes that are a danger to those working in the barn and need repair. Stray voltage at this time is not considered a problem as evidenced by the voltage readings.

The owner appears to be practicing several good mastitis control procedures such as washing and stimulation of teats, using individual washclothes on each cow, teat dipping, dry cow treating, rinsing clusters after infected cows, teat dipping dry cows, using vacuum shut-off valves on milking units, and stripping the first streaks of milk from the cow and is encouraged to continue doing these practices.

Recommendations

1. *Milking system* (call equipment dealer to fix)
   a) The reverse slope in the milkline should be fixed along with replacing any non-welded seals in the milkline.
   b) All pipleine seals should be checked for leaks and repaired.
   c) The vacuum capacity should be rechecked after all leaks are repaired so there is 20 cfm NZ per unit used.
2. *Milking equipment*
   a) The hoses on the milking units should be replaced, if cracked, and cleaned.

b) A milk bucket should be used to milk fresh and treated cows into when dumping the milk.
c) A vacuum shut-off valve should be installed in the remaining milking unit.
d) The pulsators should be checked for dirt build-up (especially unit #1) and be cleaned if needed.

3. *Milking procedure*
a) Use individual papertowels or launder and dry washclothes after each use.
b) Clean all pails that contain wash and cluster rinsing solutions.
c) Keep the udder wash solution and the teat dip jugs in a clean place. Also keep the cart that holds milking supplies as clean as possible. Store cart and supplies in the milk house because it is cleaner than in the barn.
d) Use a strip cup for collection of first streaks of milk.
e) Rinse clusters between cows by dipping two teat liners at a time in the solution to prevent airlock.
f) Dip cow's teats immediately after removal of the milking unit.
g) Establish a milking order (milk heifers first, then uninfected cows, then chronic infected animals last). This prevents infected individuals from spreading the mastitis down the milking line.
h) Make sure the pipeline is sanitized before milking and run through all three cycles of the wash cycle after milking.

4. Cows cultured positive for *Staph aureus* or *Strept agalactiae* should be milked at the end of milking. These are cows: #6; #95 red; #1; #7; #18; #20; #9; #19; #10; #25; #13; #11; and #14.

5. *Herd health*
a) Don't use dry cow treatment on lactating cows. Use an approved lactating cow treatment.
b) Make sure dry cow treatment is done on each cow because *Staph aureus* is best treated during the dry period.

6. *Barn*
a) Remove manure from pen and under the barn cleaner.
b) The stalls should be scrapped of manure to prevent manure build-up.
c) Try to lower fly population.

7. *Milk house* should be cleaned. Medicine should be kept in a single place, preferably a refrigerator.

8. *Electrical work*
a) Electrical box should be covered.
b) Open and loose electrical wires should be repaired and covered.

9. *Mastitis monitoring*
a) Enroll on the DHI program including the individual somatic cell count option.
b) Begin monthly CMT monitoring on herd.

10. Continue the good mastitis practices being done such as: washing and stimulation of the cow's udder; using individual washclothes on each cow; teat dipping; dry cow treatments; teat dipping dry cows; rinsing clusters after infected cows; using vacuum shut-off valves on milking units; and stripping the first streaks of milk from the teat canal.

Faculty Adviser: Dr. L. E. Baumann.

References

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