

# Staph Aureus and Corynebacterium Pyogenes Mastitis in a Free Stall Dairy: A Case Report

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## Introduction

After sitting through so many mastitis lectures, one easily gets the impression that all practitioners who talk about mastitis really do is sit around doodling the time away at their desks with their nose in the latest journal until that fateful moment when the phone rings. On the other end of the line is a dairyperson in distress (vapid DAPID), calling all your expertise out to solve a mastitis problem. At that moment you mobilize, just like the SWAT team, grabbing your detco recorder, flowmeter, culture tubes and CMT paddle as you fly out the door and proceed code 3 to the scene of the crime.

In real life the scenario goes more like this. You have just finished palpating 50 or 60 head with 2 more herds to go. The office has just called on the radio and asked if you could pick up an OB on the way. They report that the calf should be ready to come out because its tail has been showing for 2 days already. As you are hurriedly washing off your boots preparing to roar off in search of “the aroma”, your dairymen casually asks, “Say doc, have you got anything good for mastitis?”

A red flag goes up in your mind as you ask “What’s the trouble, Joe?” He replies “Well those tubes I got at the feed store just aren’t worth a hoot. First of all the mastitis isn’t that bad, just a little swelling and they strip a few clots. After I treat them, it clears up for a week or so then, it’s right back again. You must have some real strong tubes, huh doc?”

Well it so happens that last April as I was finishing a herd reproductive check and the owner and I were summarizing the month’s data, he pointed out that he experienced 15 clinical cases of mastitis that month. For the past several months he had noticed that an increasing number of his first calf heifers exhibited clinical mastitis at or immediately before calving. This month about 50% of the heifers were affected. Also the bulk tank leucocyte count had gradually increased over the last 5 months from a level below 200,000 to 540,000. I didn’t have to go code 3 as I was already there!

Let me pause to complete the scene for you. This individual has a 250 cow holstein herd with a 19,500 lb herd average on 3X milking. The parlor consists of a double 5 herring bone with Boumatic model 2100M take off’s (a). The cows are housed in a free stall operation with the herd broken into 4 lactating groups by production. They are fed a TMR type ration of alfalfa hay, good quality grass silage, whole cotton seed, corn distiller’s grain, ground corn, and a custom pellet

containing minerals, vitamins, and protein or energy as needed to balance the ration.

The herd had been surveyed by a university mastitis research team in 1979 and no cows were detected with *Staph aureus* on a partial herd culture. This herd had an ongoing problem with klebsiella mastitis until 2 years previously when they installed a polypropylene sheeting over the free stall bedding which effectively stopped the incidence of severe clinical mastitis. (5)

The herd was not monitoring individual somatic cell counts. Milk weights were monitored via an Agri Comp 2020 on farm computer (a) linked with the milk flow meters in the parlor. The reproductive and other data was processed by a private firm using the DairyTRAK program (b).

### Initial case workup:

On the day the problem was first discussed a bulk tank culture sample was taken, and the owner agreed to have the DHIA tester come in and collect samples for individual somatic cell counts. The milking machine service technician had been called and was due any day to do a system analysis. The owner was asked to collect some pre-treatment milk samples from the heifers for culture.

### Results:

Results of the bulk tank sample were: Total count 4,650, coliforms 20, staph 30 colonies per ml. Strep count was not done, but no strep type colonies were observed on blood agar. These counts are within “normal” range for our laboratory.

Results of the individual somatic cell counts were 75% <300,000, 10% 300-799,000, and 15% > 799,000.

*Corynebacterium pyogenes* was isolated from the heifer milk samples.

### Further Workup:

The owner was asked to submit composite milk samples from the cows who were over 600,000 on the SCC report. Also samples for bacteriological analysis were to be collected from any clinical mastitis cows before the first treatment. Any cow treated within the previous 2 weeks and also on the high somatic cell report were to be omitted due to the possibility of false negatives.

41 head were cultured. 9 samples had no growth, 2 had

Strep ubris, and 30 had Staph aureus.

After culture results were known, a special visit was made to try and further elucidate the reasons for the prevalence of staph.

The milking machine technician found no flaws in the system. The milkers were observed to be following reasonably good technique. They were drying udders with paper towels before attaching units, teat dipping with a 1% iodine dip after milking, and the units were being backflushed between cows with a home-made system incorporating a water rinse followed by a 25ppm iodine solution, a 30-45 second waiting period, and a final water rinse. At this time the owner mentioned that more water seemed to be flushing through the units on 1 side of the pit compared with the units on the other side of the parlor.

Also it was noted that the claws when in the retracted position were not hanging level allowing 2 of the teat cups to be flushed much less than their down hill mates. Investigation also revealed that indeed there was less water and flushing action on the units on one side of the parlor. Further investigation linked the reduced flow to the presence of a check valve in the water line feeding the iodine metering device. This valve had been installed approximately 1 year previously at the insistence of the state sanitary inspector who was concerned about the specter of iodine contamination of fresh water supplies.

To insure that there were no nutritional imbalances that were increasing the susceptibility of the cows, blood samples for zinc, copper and selenium were submitted for analysis and later found to be within normal range.

At this point the blame for the staph mastitis outbreak was assigned to the failure of the backflush system to adequately clean the liners, allowing spread of the bacteria in that manner.

#### *Correction and control strategy:*

A modification was made in the water line feeding the iodine proportioner which increased the pressure of the flush solution getting into the units in the parlor while still maintaining 25ppm iodine. Also special collars that fit around the claw's outlet pipe were installed to which the retraction chain was attached, thus allowing the unit to hang level and upside down in the retracted position. This insured that all teat cups would receive their fair share of flush action and disinfectant.

Since the bulk count was no where near degrade level of 1 million somatic cells, immediate culling was not advocated. All cows on the 800+ list at dry off were treated with an additional tube of benzathine cloxacillin 1 week after initial dryoff. Any cow which had shown repeated bouts of clinical mastitis during lactation were to be culled as heifers freshened to take their place. Monthly somatic cell counts were to be continued to monitor progress of the expected recovery.

27 head were culled for mastitis in June, July and August. The bulk tank leucocyte count stabilized at the 350-380,000

cell level. The owner was happy that the bulk tank leucocyte count fell below 400,000 as his processor pays a quality bonus for milk below that level.

#### *Heifer Situation:*

Investigation into the heifer problem revealed that about 50% of the first calf heifers were developing clinical mastitis in one or more quarters at the first or second milking. It seemed that the ones which bagged up early and had excessive swelling in the udder before parturition were affected most severely. The heifers were housed in the same area as the close up dry cows. There was no occurrence of this problem in the mature dry cows when they freshened. An initial recommendation was made to teat dip all the heifers with a barrier dip daily before freshening. This did not help reduce the incidence of clinical disease so a program of infusing the heifers with cloxacillin for dry cows (c) as soon as they began showing evidence of bagging up was instituted. The owner was advised to withhold milk from any heifers dry treated before freshening for 7 days after freshening.

*Results:* The clinical disease in the fresh heifers abated with dry treatment. In September and October, 1986, 34 head of heifers calved, and 2 were treated for clinical mastitis, which readily responded to a lactating cow infusion.

#### **Discussion**

We are really discussing 2 separate problems manifesting themselves at the same time in this herd. An excessive level of Staph aureus in the lactating cows, and a *C. pyogenes* infection in the first calf heifers.

The initial surprising data was the failure of the bulk tank count to elucidate the staph problem. The count was 30 cfu/ml of staph. With 30 of 41 head later cultured positive for staph one would expect to find elevated levels in the bulk tank. This could have been due to variation in laboratory procedure or sample gathering. This illustrates that a negative test result does not always mean that a disease is not present.

The flip side of that statement is the question of how significant is just one cell count over 600,000. This question seems to come up when the individual in question is the proverbial "real good cow". Recent studies showed that when a cow has one cell count above 600,000 there is a 79% probability of isolating a major mastitis pathogen. (4) In this herd the first culture sample was mostly comprised of cows over 600,000 cells on the first test. A major pathogen was isolated from 78% (32 of 41) of the samples, a figure that agrees quite well with those results.

Several studies have established the value of backflushing in conjunction with post milking teat dipping as an efficacious control procedure for staph and strep, though not effective in coliform problems. (1,2,6,15) This is logical as staph relies on colonization of teat skin and is readily transmitted by contamination of teat cup liners and udder cloths. On the other hand, other studies have shown that backflushing with

less than 25ppm iodine is not effective in reducing the number of new infections. (2,14) One author stated that flushing action was perhaps the most important determinant in the efficacy of backflushing. (12)

In the herd in question, the concentration of iodine was adequate (25ppm), but the flushing action was not. This illustrates that as often is the case in mastitis control work, exactly HOW a procedure is being done is more important than IF the procedure is being done. Just because a farm is practicing a particular thing doesn't mean it is being done right or that it is effective.

There are several other tenets of staph control that need to be emphasized. Owners are always hopeful of treating and curing staph cows since the clinical episodes are so mild. This leads one into a false sense of security that everything is ok in udderville. I find that this is particularly a problem in herds that have experienced the ravages of coliform mastitis. They often do not realize that a few of those "mild cases" can be the tip of the staph iceberg. A recent study concluded that 7% of staph infections will spontaneously clear and about 70% cure rate is obtained with a lactation treatment infusion regime. (13) The fine print is that 72% of the staphs in that study were non *S. aureus*. My clinical experience with *S. aureus* would not support even a 25% cure with treatment of lactating cows. There is some data soon to be released from researchers at Washington State University that indicates one can expect cure rates less than 10% from either lactating or dry treatment. (8) My guideline is, once a staph cow, always a staph cow until proven innocent. Owners should be counseled that if they are lucky, a few may be cured with treatment but that is the exception rather than the rule.

When a farm initially starts on a somatic cell count program, they always want to treat lactating cows on the basis of high cell counts alone. The best advice about this can be found in a study that found that this procedure will return a net —\$19.65 per cow, and thus should be discouraged. (7) The best shot at a cure will be found by treatment in the dry period. For several years we have been advocating double dry treatment at 7 day intervals for any cow drying off with a cell count over 800,000. Scientific data for this recommendation is not conclusive (3), but clinical experience supports it. The benefit is probably due to the better penetration of antibiotic in an udder 7 days after drying off. One could argue that it would be better to just dry treat once at that time. The problem with that procedure is that in a herd with a high subclinical infection level, many cows will show clinical flareups just after dry off, and also the first 2 weeks of the dry period is statistically one of the most common times for new infections to establish themselves. Infusion immediately after the last milking effectively prevents these problems.

Since it is difficult if not impossible to achieve a cure with antibiotics, all efforts should be made to minimize spread of staph in a herd. Separation into staph and non staph strings has been advocated. In my hands this has not been a practical measure. It totally disrupts any production and reproductive

grouping in a herd, and the only way to be sure which herd a cow belongs in is with repeated culturing. I find that teat dipping, proper udder preparation and effective backflushing to be the cornerstones of a program. Aggressive culling on an economically opportune basis is the ribbon that ties the package together.

Recovery from a staph problem is a prolonged event. Progress is often slow and directly related to the speed with which infected cows are leaving the herd and the efficacy of instituted control measures. The first thing the dairyman wants to know is how long it is going to take to get out of trouble. The answer is just twice as long as it took to get into trouble. In this herd the bulk tank leucocyte count started increasing in November of 1985, 6 months before the control measures were instituted in earnest. The percent of cows less than 300,000 on SCC the first 3 months after control was instituted was 70%, 74%, and 72%. New infections as indicated by new cows above 400,000 on the somatic cell report there were 7%, 5%, and 6% in June, July and August respectively. These numbers show that dramatic improvement was not made in the first 3 months after control was attempted. One could predict that around April 1987 things should be back to normal again. Due to personnel problems with the DHIA tester no somatic cell counts were done in Sept., October, or November so we are uncertain at this point the exact progress made in increasing the number of cows with cell counts below 300,000.

The heifer mastitis problem with *C. pyogenes* was quite unusual. In my practice that organism is usually encountered as an occasional problem in single cows. It is associated with outbreaks of "summer mastitis" in pastured cattle in Britain. Insects are incriminated in its spread. In this instance, the peak problem was in early spring before insects were out in force. Also the heifers were housed in the same area as the mature dry cows, and the mature animals did not show signs of clinical mastitis. This would lead one to believe that the organism gained entry into the udder sometime prior to their entry into the dry pen, and clinical disease was delayed until parturition. The pre partum infusions with cloxacillin for dry cows was quite effective. The recommendation to withhold milk for 7 days after initial milking came from previous studies we have conducted on the longevity of dry cow cloxacillin residues in milk when given to a lactating cow. We found that samples were negative to a *bacillus stearothermophilus* assay (d) on the 8th day following treatment. Dipping the heifers with a barrier dip three times daily before calving was not effective. This same lack of effect has been found in controlled studies. (11).

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(a) Dairy Equipment Co., Madison, Wi.

(b) Control Data Corporation, St. Paul, Minn.

(c) Orbenin DC, Beecham Laboratories, Bristol, Tenn.

(d) Delvotest P, G B Fermentation Industries Inc.  
Des Plaines, Ill.



## Summary

A 250 cow holstein herd experienced clinical mastitis in 50% of their first calf heifers at parturition. At the same time the bulk tank leucocyte count elevated to 540,000 from a usual 250,000. Cultures reveal *C. pyogenes* in the heifers, and *S. aureus* in the lactating herd. The heifers were successfully treated before freshening with a dry cow benzathine cloxacillin product. The staph problem was traced to inadequate flushing action in a home made backflush system. Various strategies for Staph control are discussed.

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## Abstracts

### Sero-epidemiological survey of *Dictyocaulus viviparus* infections in first-season grazing calves in The Netherlands

J. H. Boon, H. W. Ploeger, A. J. Raaymakers

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A sero-epidemiological survey of *Dictyocaulus viviparus* infections in calves was carried out using an enzyme-linked immunosorbent assay. Infection level with *D viviparus* was correlated with farm, herd and management characteristics. At least 75 per cent of the herds were infected with *D viviparus*. Calves on zero-grazing farms were infected at a lower level than calves grazing pasture. No regional differences in infection rate were observed. On 15 per cent of the farms calves had clinical husk while 51 per cent of farms had experienced husk in the past. A higher level of infection was seen when calves were housed later in the autumn. The number of calves grazing together and the stocking rate had a significant positive influence on the level of infection. No significant difference in the occurrence of clinical husk was observed between calves vaccinated against lung-worm disease and calves not vaccinated against the disease.

### Effect of halothane on bronchial calibre of anaesthetised cattle

G. C. G. Watney

*Veterinary Record* (1987) **120**, 9-12

A computer-aided forced oscillation technique was used to examine the effects of halothane on bronchial calibre in three adult cows after anaesthesia had been induced with xylazine and thiopentone. The administration of halothane failed to produce bronchodilatation, possibly owing to low resting bronchomotor tone in the animals. However, an increase in expiratory reserve volume, associated with a small fall in airway resistance, was observed, suggesting that changes in elastic recoil may make a significant contribution to changes in airway resistance during anaesthesia. The results also emphasise the importance of relating airway resistance to lung volume.