Clinical Experiences With Dry Cow Therapy and Coliform Mastitis

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Introduction

Dry cow therapy for mastitis control is not being encouraged by some dairy practitioners in western Canada, as the practice has sometimes been associated with severe, peracute coliform mastitis at freshening time. In the author's experience, the incidence of this kind of coliform mastitis varies widely by farm. Canadian dairy cows are housed for long periods of time in barns that are often dirty, moist and quite warm. This is an ideal environment for the growth and survival of coliform organisms. Sanitation at calving is often poor, allowing the cow's udder and teat ends to become very heavily contaminated with coliform organisms. However, well-managed farms also may have a severe problem with peracute coliform mastitis cases, especially following dry cow therapy. In New Zeland, Australia, and many other areas where the dairy cow is in a different environment, the incidence of postparturient coliform mastitis is apparently lower than in Canada, and dry cow therapy has been well accepted (12,13).

Review of 3 Problem Herds

A severe problem with coliform mastitis occurred in 3 herds over a period of 6 months following initiation of total herd dry cow therapy. An incidence of 7.8% and mortality rate of 3.5% occurred. The case fatality rate was 44.4% (Table 1).

The owners indicated that they preferred the "old type" mastitis to the "new type." With the old type mastitis, they didn't lose their better cows. Milking and housing sanitation appeared to be satisfactory at first glance. However, further investigation revealed flaws in milking and management practices. These were:

Farm A — A single sponge, highly contaminated with coliform organisms, was used for washing all cows.

Farm B — The maternity pen was very unsanitary and wet due to inadequate bedding and poor drainage.

Farm C — The farmer was using contaminated udder supports.

Peracute coliform mastitis was not a problem on 8 other similar-size farms which also practiced dry cow therapy.

R.J. Eberhart and J.M. Buckalew addressed the problem of coliform mastitis associated with the practice of dry cow treatment, but most of our present understanding of the problem is derived from the clinical impression of practitioners (5). Bushnell, in a presentation to the National Mastitis Council, reported that a farmer with a 100-cow herd could lose 6 cows to coliform mastitis, cull 6 more, and still make money using dry cow treatment (1). It is hard to convince the average dairy farmer of this, however, because he sees only the dead cow with coliform mastitis and does not recognize the loss of milk production due to staphylococcal and streptococcal mastitis. For this reason some practitioners refuse to recommend dry cow treatment. This has resulted in much controversy over the use of dry cow treatment.

Discussion

The concept of dry cow therapy was developed, beginning about 1950, primarily by the National Institute of Research in Dairying (NIRD) at Reading, England. Neave, Dodd and Henriques observed a high frequency of new infections of the udder during the first 3 weeks of the dry period (18.) They realized that in order to combat mastitis, these new infections must be reduced. To do this, they infused 100,000 IU of penicillin into the udder at "drying off." This treatment markedly reduced the existing staphylococcal and streptococcal infections but provided little protection against new infections. Consequently a search was conducted for other treatments which would be more effective and which would persist longer in the dry udder. Penicillin G (5 million IU in a quick-releasing oil emulsion) was shown to persist for 4 days. The semisynthetic penicillin, cloxacillin, was attractive, because no resistant strains of staphylococci had been found up to that time (14).

In 1960, Dr. Olga Uvarov reported on the concentration of antibiotics in milk after infusion (10). She demonstrated that a slow-release base aluminum monostearate infusion resulted in low levels of penicillin in the udder for up to 21 days. Then Smith, *et al.,* demonstrated that a less soluble benzathine salt of penicillin G resulted in levels of penicillin in the dry udder that were higher and persisted even longer (9). Subsequently, benzathine cloxacillin, in a slow release base, was developed. In an intensive field experiment, utilizing 888 cows, staphylococcal and streptococcal infections were reduced by 75% and 89% respectively (17). Similar results were obtained in other studies and interest spread widely (8). For more information the reader should consult W.D.

Schultze's paper, "Dry Cow Therapy: A Review," published in the proceedings of the National Mastitis Council Meeting, 1975.

Many antibiotics, singularly and in combination, have been utilized. Some of the more common of these and their approximate dosages are:

(a) Cloxacillin (500 mg)
(b) Procaine Penicillin-G (1 million IU)
(c) Dihydrostreptomycin sulfate (1000 mg)
(d) Neomycin sulfate (500 mg)
(e) Novobiocin (500 mg)

These products have an effective duration of from 5 to 25 days (11).

Cloxacillin,[a] Neomycin[b] and a combination of procaine penicillin G and dihydrostreptomycin sulfate in oil[c] are now available in Canada. The reduction of both existing and new staphylococcal and streptococcal infections during the early dry period through dry cow therapy has been a major advance in mastitis control. The importance of dipping the teats with a disinfectant after milking has been vividly demonstrated (3). The use of an effective teat dip will reduce the occurrence of new mastitis infections by 50%. A modern mastitis control program utilizes both dry cow therapy and teat dipping.

Combining dry cow therapy and teat dipping has usually achieved dramatic reductions in staphylococcal and streptococcal infection rates. Unfortunately, some of these herds have subsequently experienced severe outbreaks of coliform mastitis. An explanation of this was provided by Schalm and Woods. They observed that cows which were free of streptococci and had low levels of staphylococci, thus having low numbers of leukocytes in the udder, were more susceptible to infection by other organisms, especially coliform (7).

A pharmaceutical company,[d] which has cosponsored mastitis seminars in 6 major dairy states in the U.S., has presented data which indicated that coliform mastitis did not increase dramatically when dry cow therapy was initiated. Their information suggested that coliform mastitis did not increase, providing the dairyman was on a rigid mastitis control program (15,6). Consequently, it appears that there is not necessarily any direct relationship between herd infection rates with streptococci and staphylococci and the incidence of clinical coliform mastitis.

Coliform mastitis is not a single disease but rather a complex of bacterial infections. Associated organisms include *Escherichia coli, Klebsiella pneumoniae* and several species of Enterobacter. The predominant organism varies among individual herds and among geographical areas. There are a variety of genera and species involved. Different serological types of a single species of the coliform organism are regularly encountered in problem herds. In no case has it been found that a single strain of a coliform organism was prevalent within a herd. The evidence suggests that coliform mastitis is not highly contagious and that outbreaks cannot be attributed to the presence in the herd of a particularly invasive or virulent strain of organism. Consequently, autogenous bacterins would appear to have little value for problem herds. Coliform infections appear to be associated with unsanitary conditions. Eberhart cited Bramley's work in England which demonstrated that there was a direct relationship between levels of coliform contamination of bedding and coliform contamination of the teat apex and the incidence of new coliform infections (4). Eberhart's work demonstrated that fresh straw and shavings were superior materials for bedding. Sawdust was more highly contaminated with coliform organisms. Used bedding was more highly contaminated than fresh bedding (4). Further research on the relationship between bedding materials and coliform populations is urgently needed. The author is delighted that the National Mastitis Council has set up the Coliform Mastitis Research Committee. This committee reported to the Council in 1976 (2). It has been shown that the dry udder is relatively resistant to coliform infection and that susceptibility increases shortly before parturition (16,4). Consequently, cows should calve on clean grass pasture, if possible, or in clean, dry maternity pens. The use of sawdust in these pens should be avoided. The author prefers a dry, 10 to 12-inch deep manure pack with an abundance of clean, fresh straw on top. The most important principle in the control of coliform mastitis is to provide a clean and dry environment for the cow, particularly at the time of parturition.

The cow's udder should be washed, dried, and routine teat dipping started one week before parturition. Present-day teat dips do not appear to effectively control coliform infections (1). A more efficient teat dip is urgently needed.

At the Western College of Veterinary Medicine, Saskatoon, we are selective in our implementation of dry cow therapy. If sanitation on the farm is below standard, we do not recommend dry cow treatment until the sanitation problems are corrected. Then, when sanitation is improved, we recommend selective use on infected quarters. Only when sanitation reaches a high level is total herd dry cow therapy recommended. An example of a handout which we provide to farmers at the time dry cow therapy is initiated is presented.

Advice to Dairymen Using Dry Cow Treatment

Dry cow treatment has been a major advance in the control of bovine mastitis. Its value lies in the reduction of subclinical mastitis (which is much more common than most dairymen realize) and in the prevention of new infections of the udder during the early dry period. However, we must stress that dry cow treatment, by itself, is not the total answer to mastitis con-

[a]Orbenin
[b]Biodry
[c]Quartermaster
[d]Beecham Laboratories

trol. Absolute hygiene must be rigidly applied at all times in order to obtain the best results from dry cow treatment.

Dry cow treatment appears to reduce the cow's resistance to mastitis, especially the coliform type. Therefore, excellent hygiene is an essential aspect in the control of coliform mastitis. The following recommendations are made.

A. Dry Cows

1. At drying off, it is important to wash the cow's teats, especially the ends, with soap and water and to dry them well. The teat ends are then disinfected with alcohol and the quarter infused with the dry cow treatment.

2. A good quality teat dip should be applied immediately and repeated twice daily for one week.

3. At freshening time (7 days before freshening to 21 days after) many dry treated cows are highly susceptible to infection with coliform germs. Therefore, it is essential that these cows calve in CLEAN, DRY box stalls with abundant bedding. Clean straw over a dry, 10" to 12" manure pack is preferred. Sawdust should not be used for bedding. If the season and weather permit, the cows should calve in a clean pasture. Cows should have their udders washed and teats dipped twice daily, starting one week before they are due to calve.

B. Lactating Cows

1. These cows' teats should be washed with clean water containing an effective disinfectant. The operator should be sure that the end of the teat is CLEAN and DRY before applying the milking machine. The use of individual paper towels for each cow is recommended and operators are encouraged to wear rubber gloves.

2. The cows should be maintained in clean, dry stalls with abundant bedding, or in clean yards or pastures.

3. The milking machine should be functioning properly, in order to minimized teat end injury. Overmilking must be avoided.

4. A good teat dip should be applied immediately after removing the milking machine.

If these procedures are strenuously and consistently carried out, mastitis problems will be markedly reduced. Dry cow treatment and teat dipping will control most common types of mastitis. The hygiene program will minimize problems with coliform mastitis.

Table 1 — Incidence of Coliform Mastitis Over a 6-Month Period in Herds Practicing Dry Cow Therapy

Herd	No. of Cows	Cases	Cows Died
A	40	3	2
B	30	2	1
C	45	4	1
Total	115	9*	4**

*Morbidity rate was 7.8%

**Mortality rate was 3.5%. Case fatality rate was 44.4%.

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