J. Dairy Sci. 93:1566–1577
doi:10.3168/jds.2009-2725


# The use of a cephalonium containing dry cow therapy and an internal teat sealant, both alone and in combination

**A. J. Bradley,*†[1] J. E. Breen,*† B. Payne,* P. Williams,‡ and M. J. Green†**
*Quality Milk Management Services Ltd., Unit 1, Lodge Hill Industrial Park, Station Road, Westbury-sub-Mendip, Nr Wells, Somerset, BA5 1EY, United Kingdom
†University of Nottingham, School of Veterinary Medicine and Science, Sutton Bonington Campus, Sutton Bonington, Leicestershire, LE12 5RD, United Kingdom
‡Intervet/Schering Plough Animal Health, Walton Manor, Walton, Milton Keynes, Buckinghamshire, MK7 7AJ, United Kingdom

## ABSTRACT

The dry period is a critical time in the lactation cycle, being the optimum time to cure existing intramammary infection (IMI) as well as encompassing the periods of highest susceptibility to new infection. Currently, IMI in the dry period is controlled with antibiotic dry cow therapy. The aim of this randomized control trial was to investigate different dry cow therapy regimens by stratifying cows by likely infection status at drying off in herds with low somatic cell count (SCC; bulk milk SCC <250,000 cells/mL) in southwest England. All quarters in 890 cows were recruited. The recruited cows were categorized as either infected or uninfected on the basis of SCC and clinical mastitis history. Ipsilateral quarters within each cow were randomly allocated to receive 1 of 4 different treatment regimens according to their infection category. Quarters in high-SCC infected cows were allocated to receive antibiotic dry cow therapy either alone or in combination with an internal teat sealant; quarters in low-SCC uninfected cows were allocated to receive teat sealant either alone or in combination with antibiotic dry cow therapy. All quarters were sampled for bacteriology at drying off and again within 10 d post-calving. Quarters were subsequently monitored for clinical mastitis for the first 100 d of lactation. The mass of residual sealant was assessed immediately post-calving to allow assessment of the association of sealant retention with treatment efficacy. Models were constructed to assess the efficacy of the different regimens in preventing IMI. Apparent cure rates of existing IMI with major pathogens were consistently >90% in quarters receiving antibiotic. Combination treatment of high-SCC infected cows resulted in an increased likelihood of being pathogen free post-calving (odds ratio = 1.40; 95% credibility interval = 1.03–1.90). The benefits of combination treatment of low-SCC uninfected cows were less clear. With respect to clinical mastitis, combination treatment of high-SCC infected cows resulted in a decreased likelihood of developing clinical mastitis in the first 100 d of the subsequent lactation (odds ratio = 0.68; 95% credibility interval = 0.48–0.98). The retention of the internal sealant was adversely affected by its use in combination with antibiotic dry cow therapy.
**Key words:** dry cow therapy, cephalonium, intramammary infection, teat sealant

## INTRODUCTION

The rigorous implementation of mastitis control plans in recent years resulted in a dramatic change in both the incidence and etiology of bovine mastitis (Bradley, 2002). Historically, these control programs were focused on contagious mastitis pathogens and the control of bulk milk SCC (**BMSCC**; Dodd et al., 1969), an important part of which was the recommendation to implement whole-herd antibiotic dry cow therapy (Smith et al., 1967; Wilson et al., 1972).

The dry period is well acknowledged as being the optimal time to cure existing IMI (Wilson et al., 1972) as well as being a period of high risk for the acquisition of new IMI (Smith et al., 1985; Oliver, 1988). Research investigated the importance of infections acquired during the dry period and demonstrated how these infections influence the rate of clinical mastitis in the subsequent lactation (Bradley and Green, 2000). Importantly, research highlighted the potential importance of the dry period in the epidemiology of both environmental and contagious mastitis pathogens, and that dry period interventions can influence both the incidence and etiology of such infections (Bradley and Green, 2001; Huxley et al., 2002); one such example is the ability to reduce the incidence of clinical mastitis in early lactation caused by *Enterobacteriaceae* through selecting therapy with extended activity against these pathogens (Bradley and Green, 2001).

The renewed interest in the role of the dry period in mastitis control, coupled with the unfortunate public

Received September 13, 2009.
Accepted December 15, 2009.
[1]Corresponding author: Andrew.Bradley@qmms.co.uk

perception of prophylactic antibiotic use, led to an interest in nonantibiotic approaches to control IMI. This interest focused on the prevention of new IMI in cows with low SCC that were uninfected at drying off (**DO**) and culminated in studies investigating the utility of internal teat sealants in the prevention of new IMI in the dry period (Woolford et al., 1998; Berry and Hillerton, 2002a; Huxley et al., 2002). Once the efficacy had been demonstrated in low-SCC uninfected cows, an obvious extension was to combine the use of an internal teat sealant with antibiotic (combination treatment) in high-SCC infected cows, thereby combining the benefits of enhanced cure with antibiotics with the enhanced ability of sealants to prevent new IMI (Godden et al., 2003; Newton et al., 2008).

However, despite evidence to the contrary (Woolford et al., 1998), an assumption was made that the clear benefits of combination treatment in high-SCC infected cows could be extrapolated to low-SCC uninfected cows and that there would be a clear advantage to the use of combination treatment in all cows regardless of infection status at DO. However, this assumption is not currently sustained by scientific evidence.

Therefore, the primary aim of the research outlined was to investigate the efficacy of combination treatment in both cows that were infected and uninfected at DO in terms of reduction in IMI and incidence of clinical mastitis in the first 100 d of the subsequent lactation. A secondary aim was to assess the recovery of the internal teat sealant after calving and to determine whether this was affected by the use of the product in combination with an oil-based antibiotic dry cow therapy.

## MATERIALS AND METHODS

### Herd Selection

Six commercial dairy herds in southwest England (Somerset and Wiltshire) were enrolled. Herds were selected on the basis of existing records and participation in an individual cow milk recording scheme (to allow collation of historic SCC data). No strict criteria were imposed pertaining to BMSCC or clinical mastitis incidence, though herds typically had BMSCC <250,000 cells/mL.

### Cow Selection

Cows eligible for enrollment were in good health, had 4 functional quarters free of significant teat lesions, and had monthly individual cow SCC recordings for at least the 3 mo previously. Cows enrolled did not have systemic or intramammary antibiotics or antiinflammatory agents in the 30 d before the last milking and had an expected dry period length of at least 54 d.

### Study Protocol

***Enrollment.*** Farms were visited weekly, and cows were enrolled to the study on the day of DO. At enrollment, key cow details such as breed, parity, estimated milk yield, individual cow SCC history, treatment history, and estimated calving date were collected from farm records. Additional data such as the presence or absence of teat lesions were recorded at the time of recruitment. Prior to the final milking of the lactation and before treatment administration, each animal was identified and physically examined for suitability on the basis of the exclusion criteria. Duplicate milk samples were collected for bacteriological examination and a single sample for SCC evaluation was collected from each quarter of each eligible animal using a method described previously (Bradley and Green, 2000).

***Treatment Allocation and Administration.*** At DO, cows were categorized as high-SCC infected or low-SCC uninfected using clinical mastitis and SCC history; cows with the last 3 monthly individual SCC <200,000 cells/mL and no clinical mastitis within that period were allocated to the uninfected group; all other animals (with complete records) were allocated to the infected group.

In the high-SCC infected group, within each cow, ipsilateral quarters were randomly allocated to receive either antibiotic alone (**AB**; 250 mg of cephalonium, Cepravin Dry Cow, Intervet Schering-Plough Animal Health, Milton Keynes, UK) or combination treatment (**ABTS**; 250 mg of cephalonium, Cepravin Dry Cow, Intervet Schering-Plough Animal Health; 65% bismuth subnitrate in a mineral oil base, OrbeSeal Pfizer Animal Health, Sandwich, UK). In the low-SCC uninfected group, within each cow, ipsilateral quarters were randomly allocated to either teat sealant alone (**TS**) or combination treatment (**TSAB**). The quarter was the experimental unit, although subsequent multivariable analysis took into account the effect of clustering of quarters within cows.

At each trial site, within the high-SCC infected and low-SCC uninfected groups the combination treatment was allocated to the left or the right side of the udder in the first cow recruited; thereafter, treatments were allocated on an alternate basis according to the order that cows were recruited. Importantly, this approach ensured a balanced allocation of treatments to each side of the udder within each trial site and that allocation was temporarily matched even when small numbers of cows were recruited at a site. This approach was necessary to address any potential proclivity caused by housing