Intramammary casein hydrolysate compared with other dry treatments in dairy cattle

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Introduction

Consumers and the dairy industry are interested in alternatives to standard antibiotic dry cow therapy (DCT) for dairy cows. Objectives were comparison of intramammary (IMM) casein hydrolysate (CH) alone or combined with DCT and/or internal teat sealant (TS) with DCT + TS (Control) dry treatments. Comparisons between treatments included change in mammary involution markers bovine lactoferrin (bLf) and bovine serum albumin (BSA) in milk during the first 10 d dry and the intramammary infection (IMI) outcomes Cure, Chronic or New IMI following calving.

Materials and Methods

Criteria for study cows from 6 farms were: 40-70 d before expected calving, 4 lactating quarters, no clinical mastitis. Cows were blocked on IMI (0 or 1+ infected quarters) detected by cultures 4 d and 1 d before dryoff. Treatments were CH, CH + DCT (CHDC), CH + TS (CHTS), or CH + DCT + TS (CHDCTS). Within IMI blocks, all cows were randomized to one of the 4 treatments in one udder half and administered Control in the contralateral half. DCT was 500 mg cloxacillin benzathine (Dry-Clox®) and TS was Orbeseal®. The 2 pre-dry and 3 post-calving weekly (1-7 DIM, 8-14 DIM, 15-21 DIM) milk culture results determined: Cure (++ results for same pathogen to - - - for that pathogen), New (- - to > 1+ culture) or Chronic (++ for same pathogen to > 1+ for same pathogen) IMI outcomes. Udder halves' proportions of total-cow milk production were measured by simultaneous bucket milking of both halves just before dryoff and 72 h post-calving. Quarter milk was sampled at d0 (dryoff), 2, 4, 7, and 10 d dry and bLf and BSA involution markers were measured by quantitative ELISA. An IACUC protocol and FDA permission were obtained.

Results

Cows (n = 16 total; 4 per treatment group) assigned to the 4 treatments were not different in DIM (337), parity (3.1 lactations), or udder half percentages of total-cow milk produced between treatment groups or Control halves at dryoff (all $P \geq 0.20$, ANOVA). No complications or milk leakage were reported after dryoff. After calving, milk production was not different between treated (mean 14.3 lb/6.5 kg) and Control (13.2 lb/6.0 kg) udder halves all $P > 0.20$, ANOVA). One cow died of unknown causes (no mastitis evident) after calving. Milk bLf and BSA increased significantly in all cows from d0 (1.0 mg bLf/ml, 0.4 mg BSA/ml) to 10 d dry (15.0 mg bLf/ml, 1.5 mg BSA/ml) ($P < 0.0001$, linear mixed model), as expected during involution. The CH cows had higher bLf (23.8 mg/ml) at d7 dry than CHDC, CHTS and Control cows (mean 12.0 mg/ml) (all $P \leq .02$, linear mixed model), and CH cows had higher BSA (3.9 mg/ml) at d10 dry than CHDC, CHDCTS and Control cows (mean 0.9 mg/ml) (all $P \leq 0.04$, linear mixed model). Bacteria were isolated from 27 (42%) of quarters before dryoff, but only 7 quarters had the same isolate in both pre-treatment samples to be eligible for bacterial Cure evaluation. Cures during dry period were: CH 0/2 (0%), CHDC 1/1 (100%), CHTS 1/2 (50%), CHDCTS N/A, Control 1/2 (50%). Chronic IMI (failed cure) were: CH 2/2 (100%), CHDC 0/1 (0%), CHTS 1/2 (50%), Control, 1/2 (50%). New IMI during dry period were: CH 7/8 (88%), CHDC 2/8 (25%), CHTS 4/6 (67%), CHDCTS 5/8 (63%) and Control 15/30 (50%). Cures and Chronic IMI were not significantly different between treatment groups (Fisher's Exact Test, all $P > 0.33$). The CH treated cows' new IMI proportion (88%) was higher than that of CHTS treated cows (25%) (Fisher's Exact Test, $P = 0.04$).

Significance

Cows dry treated with any treatment that included casein hydrolysate showed no signs of discomfort or milk leakage, and mastitis bacteriological cures during the dry period were not different compared with a standard dry treatment. Those treated with casein hydrolysate alone had a faster increase in measures of mammary involution during the early dry period. Intramammary infusion of casein hydrolysate, possibly combined with internal teat sealant, at the end of lactation may be an alternative or possible adjunct to antibiotic dry cow therapy.