

Randomized controlled trial of pegbovigrastim as an adjunct therapy for naturally occurring severe clinical mastitis cases in dairy cows

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Introduction

Pegbovigrastim (PEG) is the polyethylene glycolated form of the bovine granulocyte colony-stimulating factor, a growth factor targeting hematopoietic progenitor cells, stimulating production and differentiation of neutrophils, and was developed to improve immunity of dairy cows during the transition period. In Canada, PEG is labeled for the reduction of the incidence of clinical mastitis in the first 30 days of lactation in periparturient dairy cows and replacement heifers. However, it remains unclear if it could be useful as an adjunct therapy in severe clinical mastitis cases; it is possible that an increased recruitment of neutrophils could mitigate the mortality and improve the bacteriological cure and subsequent milk production of affected cows. The main objective of this pilot study was to quantify the effect of PEG as an adjunct therapy on survival, intramammary bacteriological cure, and subsequent milk production for naturally occurring severe mastitis cases. The hypotheses were that the PEG would improve survival in the 7 d after treatment, bacteriological cure 14 d post-treatment, and milk production in the 30 d following treatment

Materials and methods

A double-blinded, randomized controlled trial was conducted in a 300-cow commercial Holstein dairy farm selected by convenience for having a high incidence of naturally occurring cases of severe clinical mastitis and for being willing to participate. Severe clinical mastitis was defined as the presence of abnormal milk and inflammation in 1 quarter or more, combined with systemic signs of illness (anorexia, lethargy, pyrexia > 39.5°C, dehydration or recumbency). This definition was standardized for farm staff before and during data collection. When a case of severe clinical mastitis was diagnosed on the farm, the cow was enrolled in the study. At enrolment, all cows were assigned randomly to 1 of 2 treatment groups: control group (CON; subcutaneous injection of 2.7 mL of 0.9% sterile saline) or PEG group (subcutaneous injection of 2.7 mL of PEG). The syringes were numbered before the start of the study and were assigned randomly using a random-number generator to contain saline or PEG; they were identical and could not be differentiated by farm staff. Milk samples from the affected quarter were taken aseptically at enrolment and 14 days later and submitted for standard bacteriological culture testing. All enrolled cows were treated following the same standardized protocol: 16 mg/kg trimethoprim-sulfadoxine IM twice daily for 5 days, 0.5 mg/kg meloxicam IV once, intramammary ceftiofur once a day for 2 days, and 2L of 7.5% hypertonic saline solution IV once. Statistics were computed with R.

Results

A total of 40 cows were enrolled in the study (20 per treatment group). Bacteria identified in milk at enrolment were *Klebsiella* spp. (n = 24; 60%), *E. coli* (n = 8; 20%), *Enterobacter* spp. (n = 7; 18%) or no growth (n = 1; 2%). Nine cows (23%) died in the first week post-treatment. The probability of surviving during the first week following enrolment was higher in the PEG group than in the control group (PEG: 19/20; 95%, CON: 12/20; 60%; OR = 12.7; *P* = 0.01). Of the cows that survived, there was no difference in the proportion of bacteriological cure at d 14 between the PEG and control groups (PEG: 12/19; 63%, CON: 6/12; 50%; OR = 2.0; *P* = 0.36). Similarly, the daily milk production of the cows that survived did not differ between the control and PEG groups over the 30-d period following enrolment (PEG: 24.2 kg/j; CON: 25.5kg/j; *P* = 0.65).

Significance

These data suggest that treating cows for naturally occurring severe clinical mastitis cases with PEG as an adjunct therapy improves short-term survival compared with saline treatment. The impact of PEG on subsequent bacteriological cure and milk production deserves to be further explored.

