

Effects of prepartum grouping strategy on immune, metabolic, health, reproductive, and productive parameters of dairy cows

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Introduction

Cows are social animals and as such are highly susceptible to social interactions and hierarchical order. Situations of limited space or access to feed and frequent regrouping during the prepartum period are expected to exacerbate aggressive and submissive behaviors. In studies conducted with a small number of cows per pen, cows had reduced feeding time, greater rate of displacement from the feed bunk and stalls, and reduced milk yield up to three to 14 days after regrouping. Therefore, weekly regrouping of prepartum dairy cows is expected to result in exposure of these cows to a continuous state of social unrest and stress during the most critical time of their lives. This abstract discusses results from a study in a commercial dairy that evaluated an 'All-In-All-Out' (AIAO) approach to regrouping prepartum cows.

Materials and Methods

Cows (mean \pm SD, 254 \pm 7 d of gestation) were paired by gestation length and randomly assigned to either AIAO or control treatments. In the AIAO treatment (n = 259), groups of 44 cows were moved into a pen where they remained for five weeks; whereas, in the control treatment (308), approximately 10 cows were moved into a pen weekly to maintain stocking density (44 cows/48 headlocks). Pens were identical in size and design, and each of the pens received each treatment a total of three times, totaling six replicates. Cows were examined at study enrollment, calving (d0), d28, and d56 for body condition score (BCS) and lameness and on d1, d4, d7, d10, and d14 for retained fetal membranes (RFM) and metritis. Cows were observed daily for displacement of abomasum (DA) and mastitis until d60. Blood samples were collected weekly from all cows from d-21 to d21 for determination of non-esterified fatty acid (NEFA) concentration. Blood samples were collected weekly from d-14 to d14 from a subgroup of cows (n = 34/treatment) to determine neutrophil phagocytosis (PHAGO), oxidative burst (OXID), expression of CD18 and L-selectin, for hematology, and glucose concentration. Milk production and milk components were measured monthly, and energy corrected milk yield was calculated for the

first three tests. Cows were examined by ultrasound for detection of corpus luteum (CL) on d39 and d56. Pregnancy exam was conducted 38 and 66 days after AI. Data were analyzed in a mixed model and the fixed effect was treatment (AIAO vs control) and the random effect was treatment within pen and replicate.

Results

Treatment did not affect BCS ($P > 0.59$) or lameness ($P > 0.35$) at any interval of the study. Similarly, treatment had no effect on incidence of RFM ($P = 0.84$), metritis ($P = 0.35$), acute metritis ($P = 0.54$), DA ($P = 0.92$), and mastitis ($P = 0.47$). Glucose ($P = 0.28$) and NEFA ($P = 0.17$) concentrations were not affected by treatment. Percentage of neutrophils positive for OXID ($P = 0.91$) and PHAGO ($P = 0.98$) and intensity of OXID ($P = 0.94$) and PHAGO ($P = 0.91$) did not differ between treatments. Additionally, percentages of neutrophil expressing CD18 ($P = 0.17$) or L-selectin ($P = 0.83$) did not differ between treatments. Number of leukocytes ($P = 0.64$), neutrophils ($P = 0.33$), and lymphocytes ($P = 0.80$) were not affected by treatment. Treatment had no effect on milk yield ($P = 0.82$), energy corrected milk ($P = 0.66$), and linear somatic cell score ($P = 0.28$). Percentage of cows with a CL on d39 ($P = 0.17$) and d56 ($P = 0.96$) and percentage of cows pregnant after first AI ($P = 0.47$) were not affected by treatment.

Significance

In the current study, the strategy of AIAO prepartum grouping did not reduce incidence of peripartum diseases and did not improve immune, metabolic, reproductive, and productive parameters, compared with those of a conventional grouping strategy. This is of relevance to the dairy industry because the mean stocking density in the AIAO treatment was 73.4%, compared with the mean stocking density of 86.9% in the conventional grouping strategy. Therefore, in herds in which AIAO grouping strategy is adopted, the dimensions of the prepartum pens would have to be increased by approximately 18% to avoid stocking density $> 100\%$ at all times.