

treated with a single prostaglandin injection. Further studies in progress should confirm the benefit of the higher doses of prostaglandin treatments on a larger scale. In the third trial, the overall conception rate was

around 50% in both groups; however, when cows ovulated earlier or later in relation to the time of AI, the conception rate was significantly lower.

Effect of Parturition Induction of Term Pregnancies on Calf Survival, Production and Reproduction in Holstein Dairy Cows

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Introduction

Longer gestations are correlated with higher birth weights, and larger calves are correlated with an increased rate of stillbirths and dystocias. Cows that experience stillbirths have a higher risk for periparturient diseases such as retained placenta (RP), downer cow syndrome, metabolic diseases, lower milk production, decreased fertility and higher risk of dying or being culled. Preventing long gestations via parturition induction may prevent delivery of larger calves and dystocia in cows. Parturition induction has been reported as a management tool to maximize utilization of pastures in Australia and New Zealand. In that situation, all cows are induced to calve or abort independent of their gestation length, causing high incidence of RP and lower milk production in the subsequent lactation.

We hypothesize that a single dose of dexamethasone given to induce parturition in cows that are past the average due date (1) will decrease perinatal calf and dam mortality; (2) will decrease the incidence of RP; and (3) will have no negative effect on milk production in the subsequent lactation when compared to non-induced cows.

Materials and Methods

This observational study was conducted on a dairy with 1,500 milking cows in northeast Spain. Artificial insemination (AI) was the only breeding method practiced on the farm. Over a period of 17 months all cows and heifers that reached 282 days of gestation were induced by administering 0.1 mg/kg of dexamethasone IM, forming the treatment group (N=620). Induction day was

arbitrarily set at 282 days of gestation (software default for calculation of due dates). To evaluate the effect of induction, all cows and heifers that reached 282 days of gestation during the 12 months following the induction period were used as control animals.

Production records were obtained electronically every day. Health, management and production records for every animal in the herd were maintained electronically in custom software. Data collected included lactation number, insemination date, calving date, "calving-ease" code, viability of newborns (24 h), incidence of RP (presence of fetal membranes for more than 24 hours after calving), total lactation length measured as days in milk (DIM) at dry-off, culling or death and average milk production for the subsequent lactation.

Results

A total of 1,213 calving records (singleton and twins) from cows with gestation length greater than 282 days, were obtained. There were 620 induced animals (cows and heifers) with a mean gestation length of 284.3 ± 1.2 days, which is statistically shorter than the mean gestation length of the 593 non-induced animals (285.1 ± 2.3 , $P < 0.001$). Inducing gestation at 282 days reduced both the mean gestation length and the standard deviation of gestation length ($P < 0.001$).

Fifteen percent of first lactation heifers had a gestation longer than 282 days, compared to 30% of adult cows. Distribution of cows by lactation number in both groups was very similar in both groups (20-22% heifers and 78-80% cows). There were a higher proportion of cows with four or more lactations in the induced group.

Calves

Incidence of stillbirths in induced (11.8%) and non-induced cows (11.1%) was very similar ($P=0.385$) when stratified by lactation groups ($P>0.131$) and compared to the rest of the herd. The proportion of dystocic calvings was 1.7% in induced cows and 2.5% in non-induced cows ($P=0.337$). Overall, dystocia resulted in 76.6% stillbirths compared to 41.6% in difficult calvings, 22.1% in posterior presentation calvings and 6.4% in normal calvings ($P<0.001$ for all comparisons).

Reproduction

There was a higher incidence of RP in cows with gestation length greater than 282 days compared to cows with gestation length less than 282 days. Incidence of RP in cows less than 282 days of gestation averaged 4.6%. Among cows with gestation length greater than 282 days, incidence of RP was 9.2% in induced cows and 13.7% in non-induced cows ($P=0.214$). Statistical comparison of RP rates within lactation groups was not possible due to small sample size.

More induced cows conceived in the lactation following the studied calving (57.9%) than non-induced cows (53.3%, $P=0.060$). Within the different lactation groups the difference was only statistically significant in second lactation cows (64.6% induced vs. 55.2% non-induced, $P<0.001$). There was no difference in pregnancy rate between the induced group and the rest of the herd during the induction period ($P = 0.106$), but the non-induced group had a significantly lower pregnancy rate than the rest of the herd ($P<0.001$). Average days to conception (days open) during the lactation following the studied calving was higher in induced than non-induced cows ($P=0.016$), but there was no difference between each group and the rest of the herd ($P>0.175$).

Production

Average milk production per cow and per day for the whole herd was higher during the control period than during the induction period (62.7 lb \pm 0.44 vs. 61 lb \pm 0.22; 28.5 kg \pm 0.2 vs. 27.8 kg \pm 0.1, $P<0.001$). The magnitude of difference between the induced and control groups was virtually identical to the difference between the herd averages over the two time periods (1.76 vs. 1.54 lb; 0.8 vs. 0.7 kg, respectively). When stratifying by lactation, this difference in milk production was only seen in cows with five or more lactations.

Cow deaths and culling

Culling and death in cows due to post-partum disease and reproductive reasons were evaluated. Twice as many cows died in the control group than in the induced group due to post-partum related problems (RR = 2.3, 95% CI 0.8 - 6.6; 11/593 vs. 5/620, $P=0.091$). Culling due to reproductive reasons was also lower in induced cows (40.1%) compared to control cows (54.2%,

$P=0.005$). Compared to the rest of the herd during the respective periods, culling in induced cows was similar ($P=0.106$), while non-induced cows had much higher culling ($P<0.001$). Culling and death rates stratified by lactation group followed the same trend. Stratified analysis by lactation number showed significantly greater culling in non-induced heifers and third or more lactation cows ($P<0.001$), but not in second lactation cows.

Significance

In conclusion, we found that inducing parturition in cows that were past the selected due date (282 days of gestation) was not detrimental to calf survivability, but diminished culling pressure on the dam due to better health and reproduction. In general there seemed to be no effect of parturition induction on the newborn. The incidence of stillbirths was very similar in both groups, so we conclude that inducing parturition in cows does not negatively affect neonatal survival. In this herd, personnel were available 24 hours a day to observe calvings and intervene, if necessary, to improve neonatal survival. In dairies where calving observation is not constant results may differ.

There was an overall positive effect of parturition induction on the cow. More cows became pregnant in the induced group than in the control group. The proportion of cows culled due to reproductive reasons was also lower in induced cows than in control cows. The greater culling rate due to reproductive reasons in non-induced cows is related to conditions that could not be determined just by calving ease score, because this was similar in both groups. The difference in milk production between induced and non-induced cows was the same as for the rest of the herd during the control and induction period. So the difference in milk production can be explained by the natural increase in milk production for the whole herd over time.

Stratified analysis by lactation group showed the largest differences in first lactation cows and in older cows. First lactation heifers should have the best genetic potential of the herd and have the highest amortization values. Lower culling rates will allow these animals to return the investment of their rearing. Older cows have proven their superior genetics by surviving economic and physiologic selection pressures. Given that 30% of older cows have gestations longer than 282 days, there is an opportunity to reduce reproductive culling in these animals by inducing parturition. Our results show that parturition induction in cows past due date can increase herd profitability when compared to allowing cows an extended gestation period, and should be considered as an effective management tool in dairies. It can be applied across the herd or targeted towards heifers and valuable old cows.