

Research Summaries

Session II - Reproduction and Metabolic Disease

Moderators: Dawn Morin
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Effects of Nutrition During Gestation on Birth Weight and Viability of Calves, and Weight and Expulsion Time of Placenta in Dairy Cattle

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Introduction

Calf mortality and retention of placenta are important reproductive problems in cattle. The neonatal calf mortality can be caused by a variety of factors. One of the neglected causes may be suboptimal nutrition during gestation. As for the retention of placenta, immaturity of placenta is a major cause. Since the fetus and placenta develop as a unit in the uterus, nutrition during gestation may influence fetal and placental development. The objectives of this study were to determine the maternal nutritional state during the last two trimesters of gestation and describe possible effects of nutrition on calf birth weight and viability; weight of the placenta; and time for expulsion of placenta in dairy cattle.

Materials and Methods

Holstein Friesian pregnant cows totaling 41 were used. Duration of dry period was 74±2 days. Average milk yield (4% FCM) per cow per lactation for 305 days was 9795±146kg (321 lb).

Blood samples were collected via the tail vein between 90 days of pregnancy and parturition: once a month from days 90 to 180; every two weeks from days 181 to 270; and every day thereafter. Plasma concen-

trations of glucose, non-essential fatty acids (NEFA), total cholesterol, total protein (TP), Ca, Pi, Mg, aspartate aminotransferase and gamma glutamyl transferase and blood urea nitrogen (BUN) were determined using a biochemical auto-analyzer. For each plasma parameter, cows were classified into three groups-low, mid and high-values, according to quantile (terciles) of the mean.

Body condition was scored twice, at early and late dry periods, on a 1-to-5 scale with 0.25 increment (2). Calf birth weights were measured before colostrum was ingested. Calf viability was evaluated by a modified Apgar's score.

The fetal membrane was considered to be retained (RFM) when it had not been expelled within 12 hours after calving. Cotyledons were weighed after dissection from the chorioallantoic membrane.

Results and Conclusions

All calves delivered from the 41 cows were singletons. Mean gestation length was 283.7± 0.5 days and mean body weight of cows at parturition was 761± 11 kg (1,674 lb). Mean cotyledonary weight was 1562± 33 g (50 oz).

Mean birth weights were 47.4±1.1 kg (104 lb) for female and 49.8±0.8 kg (110 lb) for male calves.

Of the 41 cows, 10 had weak calves and 13 had RFM. No significant effects on the cotyledonary and calf birth weights, incidences of neonatal weakness or RFM were linked to parity, bull, lactation length, milk yield, gestation length, cows' body weights or gender of calves.

Plasma NEFA started to increase from 255 days of pregnancy to day of parturition, showing a drastic increase for a last few days. A rapid in plasma glucose was also shown for the last few days. Conversely, plasma TP, cholesterol and BUN showed a gradual decrease during the same period. Cows showing low plasma glucose and TP concentrations at 90 to 210 days had lower

birth weights and cotyledonary weights, and a higher incidence of neonatal weakness. Likewise, cows with low glucose, cholesterol and Ca concentrations in plasma at 255 days and later had a higher incidence of RFM.

A group of cows with BCS of 3.25 to 3.75 during the dry period showed fewer RFM, compared to other groups with BCS of 3.0 or lower and 3.75 or higher.

Results indicate that low intake of energy and protein in mid- and late-gestation adversely affects fetal development, leading to neonatal weakness. Low intake of energy and Ca in late gestation may cause RFM.

Parenteral Vitamin E for Prevention of Retained Placenta in Dairy Cows

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Introduction

Immune function is suppressed in periparturient dairy cows, and risk of infectious and metabolic disease is increased. Several studies have shown that transition cows supplemented with vitamin E in feed and/or parenterally had decreased risk of retained placenta (RP) or mastitis. However, these benefits are not universally reproducible and may depend on the animals baseline vitamin E and selenium status and other factors. Additionally, a fraction of animals will have hypersensitive reactions to parenterally administered vitamin E. This study investigated the effect of vitamin E on the incidence of periparturient health problems when administered subcutaneously to prepartum cows.

Materials and Methods

Approximately one week prior to expected calving date, 1166 cows in 19 herds were randomly allocated to receive either a single SC injection of 3000 IU Vitamin E (d- α -tocopherol) or placebo. Incidence of peripartum disease (retained placenta, milk fever, metritis, ketosis, displaced abomasum, clinical masti-

tis, and lameness) was recorded. Data were analyzed in SAS using the GENMOD procedure, including herd as a random effect.

There was no evidence of clustering of results by herd. However, the risk factors for RP and the effect of Vitamin E on RP were different between primiparous and multiparous cows, so these parity groups were modeled separately. Having twins was so strongly associated with RP that it overwhelmed the effect of other variables. Therefore, 29 animals delivering twins were removed from the models (2 in parity 1, 27 in parity ≥ 2). Occurrence of dystocia was offered to the models but was not a significant effect.

Results and Conclusions

Among primiparous animals, both treatment and the interval from treatment to calving (treatment*week interaction) had significant effects ($P < 0.01$) on probability of RP. Heifers appear to benefit from vitamin E by reduced risk of RP, but when administered by SC injection, vitamin E should be given approximately 2 weeks prepartum.

Among multiparous cows, occurrence of milk fever was significantly associated with increased risk of