Association between prepartum dry matter intake, net energy balance, and postpartum diseases in dairy cows

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Introduction

The transition period in dairy cows is characterized by a drop in dry matter intake, leading to lipid mobilization in the form of nonesterified fatty acids (NEFA) and an increase in ketone bodies such as beta-hydroxybutyrate. Concentrations of NEFA ≥ 0.3 mEq/L during 14 to 2 days prepartum can predict diseases like displaced abomasum, clinical ketosis, metritis, and retained placenta (RP). These diseases reduce milk yield, impair reproductive performance, and increase culling, hence incurring economic losses. The association between DMI prepartum and disease incidence postpartum has not been extensively studied. The primary objectives of this study were to determine the association between prepartum dry matter intake (DMI), DMI as percentage of body weight (DMI%BW), and net energy balance (NEB) (-21 days) and postpartum diseases or disorders; calving problems (dystocia, twins, stillbirth), RP, metritis, mastitis, metabolic problems (hypocalcemia, ketosis), digestive problems (indigestion, displaced abomasum), lameness, and disease (Dz) (no disease, 1 disease, ≥2 diseases). A secondary objective was to use DMI, DMI%BW and NEB prepartum to predict Dz postpartum.

Materials and Methods

This was an observational study where the DMI data from a total of 476 cows from 9 different experiments were collected. All the experiments recorded DMI daily for each cow, from day -21 to -1 prepartum, using a system with individual feeding gates. Body weight was also recorded, and it was used for calculation of DMI%BW and NEB. Dz were recorded during the first 28 days postpartum. Continuous outcomes (DMI, DMI%BW and NEB) were analyzed by ANOVA for repeated measures using the MIXED procedure of SAS and dichotomous outcomes (diseases or disorders) were analyzed by logistic regression using the LOGISTIC procedure of SAS. Models included the effects of parity (primigravid vs multigravid), BCS (≤ 3.5 vs > 3.5), time (d -21 to d -1) and heat stress abatement (cool vs hot without EVC vs hot with EVC), and cow nested within experiment as random. Differences with $P < 0.05$ were considered significant.

Results

Cows with RP had lesser DMI and DMI%BW, and lesser NEB on d -3. Cows with metritis had lesser DMI%BW (1.55 ± 0.04 vs 1.65 ± 0.02 kg/d), and lesser NEB (1.86 ± 0.38 vs 2.87 ± 0.22 Mcal/d). Cows with mastitis had lesser DMI on d -4 and -1. Cows with metabolic problems had lesser DMI%BW (1.54 ± 0.03 vs 1.67 ± 0.02 kg/d). Cows with digestive problems had lesser DMI%BW (1.55 ± 0.04 vs 1.65 ± 0.02 kg/d). Cows that had ≥2 Dz had lesser DMI (10.24 ± 0.19 vs 10.89 ± 0.17 kg/d), lesser DMI%BW (1.54 ± 0.03 vs 1.71 ± 0.03 kg/d), and lesser NEB (1.91 ± 0.28 vs 3.49 ± 0.33 Mcal/d). Cows with at least one Dz had lesser DMI (10.37 ± 0.14 vs 10.90 ± 0.18 kg/d), lesser DMI%BW (1.58 ± 0.02 vs 1.71 ± 0.03 kg/d), and lesser NEB (2.02 ± 0.22 vs 3.31 ± 0.34 Mcal/d). Prepartum DMI, DMI%BW, and NEB was not associated with calving problems or lameness. The results of the dichotomous variables outcomes show that for each kg decrease in the average DMI in the last 3 d prepartum, the odds of having metritis increased by 10%, digestive problems by 12%, and at least one disease by 16%. For each 0.1% decrease in the average DMI%BW in the last 3 d prepartum, the odds of having metritis increased by 7%, metabolic problems by 8%, digestive problems by 10%, and at least one Dz postpartum by 14%. For each Mcal decrease in the average NEB in the last 3 d prepartum, the odds of having metritis increased by 8%, metabolic problems by 5%, digestive problems by 6%, and at least one Dz postpartum by 13%.

Significance

In conclusion, these data indicate an association between prepartum DMI, DMI%BW, NEB with RP, metritis, mastitis, metabolic problems, digestive problems, lameness, and Dz. Furthermore, DMI, DMI%BW and NEB in the last 3 d prepartum can be used to predict metritis, digestive problems, and at least one Dz postpartum.