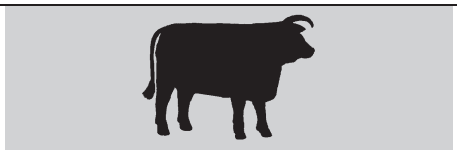
The Professional Animal Scientist 31 (2015):264–269; http://dx.doi.org/10.15232/pas.2014-01374



Grazing behavior of drylot-developed beef heifers and the influence of postinsemination supplementation on artificial-insemination pregnancy success

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ABSTRACT

Research has indicated that moving drylot-developed heifers to spring forage immediately after AI adversely affects ADG and AI conception rates. Our objective was to determine the effect of adaption to grazing on ADG and activity, and whether post-AI supplementation would improve AI pregnancy success. In Exp. 1, heifers were developed in a single pen. At the start of treatment (d −44) heifers were blocked by BW and either remained in the drylot (DLT; n = 34) or were moved to forage (GRS; n = 35). Pedometers were placed on 5 heifers per treatment on d −19. On d 0, DLT heifers were moved to forage. Heifers on GRS had decreased (P < 0.01) ADG from d −44 to −35 compared with DLT heifers. Following being moved (d 0) DLT heifers had decreased (P < 0.01) ADG compared with GRS heifers. Initially, GRS heifers took more (P < 0.05) steps, but after being moved, DLT heifers took more (P < 0.05) steps from d 0 to 3. In Exp. 2, drylot-developed heifers (n = 301) at 2 locations were synchronized with the 7-d CIDR protocol. At AI, heifers were randomly assigned within location to be either moved to pasture or moved to pasture plus being supplemented. Pregnancy success was affected by treatment (P = 0.02), with supplemented heifers having improved pregnancy success. In summary, moving drylot-developed heifers to forage affected performance and activity, but supplementation when moved to pasture at AI improved pregnancy success.

Key words: fertility, grazing behavior, heifers, post–artificial insemination nutrition

INTRODUCTION

The United States beef and dairy industries are affected by reproductive failure, with costs totaling approximately $1 billion annually (Bellows, et al., 2002), and the economic value of reproduction is 5 times greater than calf growth for commercial beef producers (Trenkle and Willham, 1977). Research has indicated that moving drylot-developed heifers to spring forage immediately after AI adversely affects ADG and AI conception rates (Perry et al., 2013). However, after 27 d of grazing there was no difference in ADG between heifers developed in a drylot and heifers developed on forage (Perry et al., 2013). Grazing skills and dietary habits are learned early in life (Provenza and Balph, 1988). This learning is important to the development of motor skills necessary to harvest and ingest forages (Provenza and Balph, 1987), and they allow animals to increase their consumption of forage (Lyford, 1988). These skills, acquired between weaning and breeding, are carried through to the next grazing season (Olson et al., 1992).

Nutritionally mediated changes to the uterine environment can occur by changing components of uterine secretions or by influencing the circulating concentrations of progesterone that regulate the uterine environment

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(Foxcroft, 1997). Hill et al. (1970) reported decreased embryonic growth among heifers fed 85% maintenance requirements of energy and protein on d 3 and 8 after insemination compared with heifers fed 100% maintenance. Therefore, undernutrition immediately following insemination can have an effect on embryo survival and the ability of heifers to conceive or maintain a pregnancy during a defined breeding season. The objectives of these experiments were to determine the effect of adaption to grazing on BW change and activity when heifers were moved to spring forage (Exp. 1) and whether supplementing heifers moved to pasture following AI improved pregnancy success (Exp. 2).

MATERIALS AND METHODS

The South Dakota State University Animal Care and Use Committee approved all procedures.

Exp. 1

Experimental Design. Angus-cross beef heifers were developed in a single pen following weaning until 14 mo of age. At the start of treatment (d −44) heifers were blocked by BW and allotted to 1 of 2 treatments. Heifers either remained in the drylot (**DLT**; n = 34) or were moved to spring forage (**GRS**; n = 35). Body weights were collected on d −44, −35, −24, −3, 9, and 30. All heifers were moved to feedlot pens without feed for >12 h before being weighed. Pedometers (IceCubes by IceRobotics, Edinburgh, Scotland) were placed on 5 heifers per treatment on d −19 to determine number of steps and amount of time standing or lying. Days in which GRS heifers were brought from the pasture to the working facilities were removed from the data set before analysis. Heifers in DLT remained in a single drylot pen from d −19 to 0. However, to maintain normal grazing management, GRS heifers were moved to a new pasture on d −9. On d 0 GRS heifers were moved to a new pasture, and DLT heifers were moved to spring forage but were maintained separate from GRS heifers (~12.1 ha per group). Primary grasses within these pastures were smooth brome (*Bromus inermis*), quackgrass (*Elytrigia repens*), and Kentucky bluegrass (*Poa pratensis*). The period of time when heifers were being moved to pasture was removed from pedometer data set, and data were analyzed as activity in each 24-h period following when heifers were moved to pasture. All heifers were synchronized with the prostaglandin (**PG**) 6-d CIDR (controlled internal drug-releasing device) protocol, which included an injection of $PGF_{2\alpha}$ (25 mg as 5 mL of Lutalyse i.m.; Pfizer Animal Health, New York, NY) on d −12, an injection of gonadotropin-releasing hormone (**GnRH**; 100 μg as 2 mL of Cystorelin i.m.; Merial, Athens, GA) and insertion of a CIDR (Pfizer Animal Health) on d −9, a $PGF_{2\alpha}$ injection and CIDR removal on d −3, and an injection of GnRH on d 0 for all heifers.

Statistical Analysis. For each treatment evaluated, animal was used as the experimental unit because the treatment applied was movement to a grazing situation and was applied to each individual animal. In addition, there was sufficient forage present in the pastures, and all animals were allowed to freely move around each pasture and were allowed to consume ad libitum intake. The effects of adaption to grazing on ADG, number of steps taken, and amount of time standing or lying were analyzed by ANOVA for repeated measures using the MIXED procedures (SAS Institute Inc., Cary, NC) as described by Littell et al. (1998). All covariance structures were modeled in the initial analysis; indicated best-fit covariance structure for BW was compound symmetry, anteindependent for ADG, and heterogeneous compound symmetry for pedometer data and were used for the final analysis. The model included the independent variables of treatment, day, and treatment × day. When a significant ($P \leq 0.05$) effect of treatment, day, or treatment × day was detected, least squares means were separated by the Pdiff option (SAS Institute Inc.).

Exp. 2

Experimental Design. Angus-cross beef heifers (n = 301) at 2 locations were developed within location as a single group from weaning until AI on a corn-silage concentrate diet. At time of AI, heifers were randomly assigned to 1 of 2 treatments: (1) moved to pasture (**RNG**) or (2) moved to pasture and supplemented with 2.2 kg per heifer per day of dried distillers grains plus solubles for 42 d (**RNG-SUPP**). Forage biomass and nutrient compositions were determined when heifers were moved to pastures (d 0; Table 1). Biomass was determined by clipping useable forage at a height of 2.54 cm within a 0.96-m^2 loop. Forage samples were weighed and dried, and DM forage was calculated (Table 1). Primary grasses at location 1 were smooth brome (*Bromus inermis*), quackgrass (*Elytrigia repens*), and Kentucky bluegrass (*Poa pratensis*). Primary grasses at location 2 were smooth brome (*Bromus inermis*), big bluestem (*Andropogon gerardi*), quackgrass (*Elytrigia repens*), and Kentucky bluegrass (*Poa pratensis*).

All heifers were synchronized with an injection of GnRH (100 μg i.m. as 2 mL of Cystorelin i.m.; Merial) and insertion of a CIDR device and 7 d later an injection of $PGF_{2\alpha}$ (25 mg i.m. as 5 mL of Lutalyse i.m.; Pfizer Animal Health) at time of CIDR removal. At location 1 (n = 143; 406.9 ± 3.1 kg), estrus detection was done with the aid of EstroTect (Western Point Inc., Apple Valley, MN) estrus-detection aids, and approximately 12 h following the initiation of standing estrus, heifers were inseminated by 1 of 3 technicians to a single sire. Heifers not detected in estrus were inseminated at 72 h after CIDR removal with an injection of GnRH (100 μg i.m.) concurrent with insemination. An equal number of heifers inseminated at 72 h with GnRH were assigned