Comparison of Fetal Losses from Diagnosis of Pregnancy Using Ultrasonography or Rectal Palpation in Beef Heifers by Novice or Experienced Technicians

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ABSTRACT

Pregnancy diagnosis is widely practiced in cattle production systems. Ultrasonography is an alternative technique to rectal palpation for pregnancy diagnosis. Fetal losses caused by rectal palpation are well documented; however, reported losses from ultrasonography for pregnancy diagnosis are often confounded by normal embryonic losses during early gestation. Losses caused by inexperienced technicians have been reported previously, but limited information is available on technicians that are in the learning process. Our objectives were to compare fetal losses from pregnancy diagnosis during early gestation for 1) stage of gestation at the time of diagnosis (<53 or ≥53 d), 2) method of diagnosis (ultrasonography or rectal palpation), and 3) different skill levels of the technicians (novice or experienced). Beef heifers (n = 2,190) exposed to natural service for 27 d, followed by diagnosis of pregnancy between 42 and 74 d of gestation were used to evaluate these objectives. Overall loss was 1.55%. Risk of loss was greater (P < 0.01) in heifers <53 d pregnant compared with heifers ≥53 d (3.46 vs. 1.26%; a 2.74-fold increase) at the time of evaluation. Greater fetal loss (P = 0.051) occurred with rectal palpation than with ultrasonography (2.68 vs. 1.29%; a 2.08-fold increase). Heifers evaluated by inexperienced technicians had a 2.07% fetal loss, whereas heifers evaluated by experienced technicians had only a 1.06% loss (P < 0.01; a 1.95-fold difference). Cattle producers and veterinarians should recognize the importance of stage of pregnancy, level of technician experience, and method of diagnosis used to reduce losses attributable to pregnancy diagnosis.

Key words: pregnancy diagnosis, rectal palpation, reproductive loss, technician experience, ultrasonography

INTRODUCTION

The development and breeding of beef replacement heifers is a large investment for the beef producer (Meek et al., 1999). Determination of pregnancy has routinely been incorporated as a tool in replacement heifer management (USDA, 2009). Wisnicky (1948) described a manual method that has become the standard method for assessing pregnancy in cattle. Historically, this method of pregnancy evaluation has been widely practiced in the dairy industry and among beef production systems, especially in the western United States (USDA, 2009). In recent years, the use of ultrasonography for pregnancy determination has been established (Hanzen and Delsaux, 1987; Beal et al., 1992; Fricke, 2002, Lamb and Fricke, 2005). Fetal losses associated with the use of rectal palpation are well documented (Abbitt et al., 1978; Franco et al., 1987). The reported losses associated with the use of ultrasonography for pregnancy diagnosis are often con-

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founded by the effects of normal embryonic losses during early gestation (Beal et al., 1992; Lamb et al., 1997). Studies are lacking on the comparison of reproductive losses associated with the techniques of rectal palpation and ultrasonography without the confounding of normal embryonic losses. Embryonic losses are defined as the normal attrition of embryos that occurs up to approximately 37 to 42 d of gestation (Fosgate and Smith, 1954; Romano et al., 2007). Abbitt et al. (1978) reported losses with clinicians at different skill levels, but limited information is available on technicians that are in the learning process. The objectives of this study were to compare reproductive losses from pregnancy diagnosis during early gestation for 1) stage of gestation at the time of diagnosis (<53 or ≥ 53 d), 2) method of diagnosis (ultrasonography or rectal palpation), and 3) different skill levels of the technicians.

MATERIALS AND METHODS

The animals used in this study were managed in accordance with best practices for low-stress animal handling and Colorado State University Animal Care and Use guidelines. No more than 3 rectal examinations (palpation or ultrasonography) were conducted on any 1 animal to minimize animal discomfort. Replacement beef heifers (n = 2,190) from 4 herds on the same ranch in Western Nebraska were examined for pregnancy by either ultrasonography or rectal palpation and by experienced or novice technicians.

Heifers were developed during the winter on native Nebraska Sandhills range with minimal harvested feed inputs of meadow hay and with a commercial protein supplement fed as a compressed cake to a prebreeding target BW of approximately 55% of expected mature BW. Routine prebreeding management practices included the collection of individual heifer BW and vaccinations for viral reproductive diseases (Bovishield Gold FP, Pfizer Animal Health, New York, NY) in April 2007, approximately 40

to 50 d ahead of the breeding season. Heifers were all naturally serviced on native Sandhills range for 27 d (June 12 to July 9, 2007). Bulls used for breeding received a reproductive soundness examination in late April according to the guidelines of the Society for Theriogenology (Chenoweth et al., 1992; Beef Improvement Federation, 2006). Only bulls receiving a Satisfactory classification were placed in the breeding pastures. The average heifer-to-bull ratio was 29:1.

Pregnancy was diagnosed by either rectal palpation or ultrasonography from August 20 to 25, 2007; therefore, heifers could have been 42 to 74 d pregnant at the time of diagnosis. An Aloka 500 ultrasound instrument with a 5-MHz linear probe (Aloka, Wallingford, CT) was used for ultrasonography. Evaluations were done by 12 technicians, with 10 technicians having limited experience. The 10 novice technicians were either senior veterinary students or first-year veterinary interns in the food animal medicine program at Colorado State University. Novice technicians had elected to take additional training in beef cattle pregnancy diagnosis as part of their training program. All novice technicians had previously received classroom instruction and, in most cases, had also received some laboratory and field instruction on both pregnancy diagnosis techniques before the initiation of the rotation. The 2 experienced technicians had extensive practical rectal and ultrasound diagnosis training with more than 30,000 palpations and 2,500 ultrasonography evaluations each.

Early in the data collection week, the proper process of pregnancy evaluation by both methods (palpation and ultrasonography) was taught to all novice technicians and verified by an experienced technician. As the week progressed and technical competency of the novice technicians increased, they were allowed to diagnosis pregnancy by either technique on their own or together with other novice technicians. They also were allowed the option of having an experienced technician verify their di-

agnosis. Thus, individual heifers may have been evaluated by up to 3 inexperienced technicians or an experienced technician. Technicians not only determined the pregnancy status but also the duration of pregnancy. The range of duration of pregnancy at the time of initial evaluation was between 42 and 74 d of gestation. Based on an earlier study (Abbitt et al., 1978) of pregnancy losses, and to establish the most practical information from our study, duration of pregnancy was divided into 2 categories (i.e., <53 or ≥ 53 d of pregnancy). At 53 d of pregnancy, the amnionic vesicle is clearly distinguishable and can be measured by both rectal palpation and ultrasound techniques. Data were tabulated as novice only or as experienced technician, whether experienced technicians evaluated pregnancy singly or together with novice technicians.

Considerable planning and recording effort was done to ensure the accuracy of data collection. Because multiple heifers could be evaluated simultaneously by different technicians, a chalk-marking system was developed to track the technician, estimated duration of pregnancy, and method of evaluation. On release from the pregnancy testing chute, the heifers entered a hydraulic squeeze chute where BCS (Richards et al., 1986) and BW were recorded.

The design of this experiment had to fit the management system of the ranch and still address the study questions. The ranch managers allowed reevaluation only of heifers that displayed standing estrus 35 to 41 d after the initial pregnancy diagnosis. To accomplish this, heifers received an Estrotect heat detection patch (Estrotech, Spring Valley, WI) on the tail head at the time of the first pregnancy diagnosis. Over the succeeding days, the herd manager periodically sorted heifers from the group that had at least 50% of the patch color rubbed off or that had lost the patch because of repeated mountings. A total of 855 heifers were reevaluated between 77 and 112 d of gestation to establish the level of fetal loss. The reevaluation was done by a single experi-