

# **Influence of Time of Insemination after the Onset of Estrus on Pregnancy Rate of Beef Heifers**

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## **Story in Brief**

With the ability to precisely determine the onset of estrus, the optimal time for artificial insemination (AI) should be determined. A radiotelemetric system was used to detect the onset of estrus in Angus x Hereford beef heifers (n=161) during three years. Onset of estrus was defined as the first of two mounts received within 4 h. Estrus was induced by treatment with PGF<sub>2</sub>α, and heifers were randomly allotted for AI by one technician at 1 to 4, 16 to 20 or 32 to 36 h after the onset of estrus. Pregnancy rate was determined 26 to 32 d after AI by ultrasonography. Pregnancy rate was not significantly influenced (P>0.10) by time of AI relative to the onset of estrus and averaged 64, 70, and 65% for AI at 1 to 4, 16 to 20 and 32 to 36 h, respectively, after the onset of estrus. With the limited number of heifers in each treatment (n=50 to 56), additional observations will be necessary to determine if semen from different bulls influences pregnancy rate with AI between 1 and 36 h after the onset of estrus. Acceptable pregnancy rates were achieved when beef heifers were AI 1 to 36 h after the onset of estrus.

Key Words: Artificial Insemination, Estrus, Pregnancy, Reproductive Performance

## **Introduction**

Time of initiation of estrus is the best external sign to estimate time of ovulation and when to inseminate cows. Duration of estrus in dairy heifers and cows were similar and averaged 15.3 and 17.8 h, respectively (Trimberger, 1948). When estrus was continuously monitored with a radiotelemetric detection system, the duration of estrus in dairy cows was 7 to 10 h (Walker et al., 1996; Dransfield et al., 1998) and 16 to 18 h in beef cows (White et al., 2002). Beef cows ovulated 31 h after the onset of ovulation, and time of ovulation was not influenced by season in Oklahoma (White et al., 2002). With the use of radiotelemetry to accurately determine the onset of estrus, it may be possible to improve reproductive performance. However, information is not available for beef cattle as to when to inseminate to maximize fertility. The objective of this experiment was to determine the effect of time of artificial insemination (AI) relative to the onset of estrus on pregnancy rate of beef heifers.

## **Materials and Methods**

Angus x Hereford heifers (n=160; 15 to 20 months old) were randomly assigned to AI treatments at estrus during May and June of three years. Heifers were assigned to be inseminated at 1 to 4, 16 to 20, or 32 to 36 h after the onset of estrus. One to three sires were blocked to treatments each year. Heifers were maintained in a pen and usually more than one heifer was in estrus. Estrus was determined with radiotelemetry mount detectors (HeatWatch). Groups of 8 to 16 heifers were treated with prostaglandin F<sub>2</sub>α (PGF<sub>2</sub>α, Lutalyse, 25 mg, Pharmacia Upjohn) on d 0 and retreated on d -7 if estrus was not detected. Onset of estrus was the first of two mounts received within 4 h. The end of estrus was the last mount received, with a mount 4 h before, and

none in the next 12 h. Pregnancy was determined at 26 to 32 d after AI by transrectal ultrasonography.

The effect of time of AI and bull on pregnancy rate, duration of estrus, and number of mounts received, were analyzed using least squares analyses of variance (SAS 1990). Terms included in the model for pregnancy rate were year, time of AI, and the two-way interaction. Terms in the model for duration of estrus and mounts received were year, time of AI, pregnancy, and all two- and three-way interaction with  $P < .20$ . Terms in the model for evaluation of bull effect were pregnancy, time of AI, and the interaction.

### Results and discussion

Time of insemination after the onset of estrus did not influence pregnancy rate (Figure 1;  $P > 0.10$ ; numbers above the bars are the percentages pregnant, numbers in bars are the numbers of heifers per treatment). Pregnancy rate was 64, 70, and 65% for AI at 1 to 4, 16 to 20 and 32 to 36 h, respectively, after the onset of estrus. It is possible that the semen used could influence the response to time of insemination. Preliminary observations (Figure 2; numbers above the bars are the percentages pregnant, numbers in the bars are the number of heifers per treatment per bull) with only three bulls suggest ( $P > 0.10$ ) that a specific source of semen may result in a greater pregnancy when heifers are inseminated early (1 to 4 h) or late (32 to 36 h). Only 50 to 56 heifers were inseminated at each time after the onset of estrus. Additional observations will be obtained to evaluate whether source of semen influences pregnancy rate when beef heifers are inseminated early or late after the onset of estrus.

Figure 1

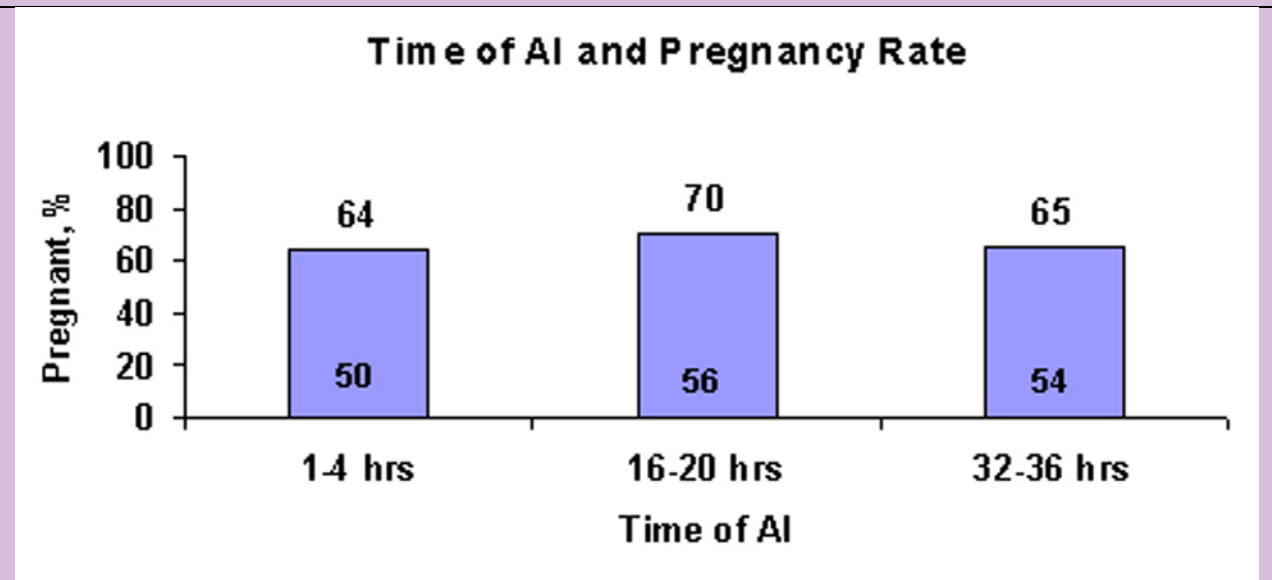
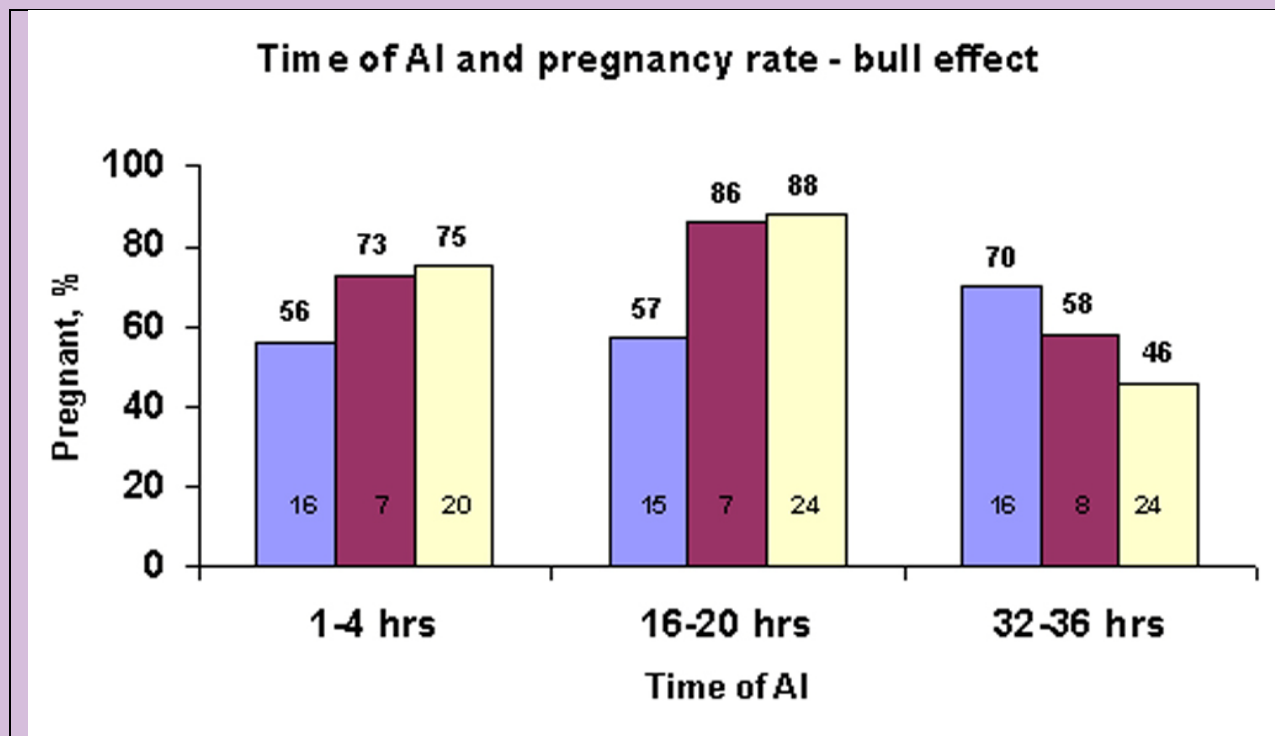


Figure 2



The time of insemination and whether the heifer became pregnant were not related to the duration of estrus (Table 1). Heifers were in estrus for an average of 11.8 h. Thus insemination did not influence the duration of estrus because the duration of estrus was similar for heifers inseminated during estrus (1 to 4 h) and heifers that were inseminated after the end of estrus (32 to 36 h). In addition the duration of estrus did not influence whether or not the heifers became pregnant. The number of mounts that heifers received during estrus was not related to time of insemination or whether the heifers became pregnant. Heifers received an average of 28 mounts during estrus.

|            | Time of AI after onset of estrus, h |       |       |
|------------|-------------------------------------|-------|-------|
| Conception | 1-4                                 | 16-20 | 32-36 |
| Yes        | 11.7                                | 12.0  | 13.4  |
| No         | 8.4                                 | 12.5  | 11.5  |

Mean = 11.8 h, n=141

In this study pregnancy rate was similar for heifers inseminated 1 to 4, 16 to 20 or 32 to 36 h

after the onset of estrus. With limited observations it can not be determined if the source of semen, or bull, interacts with time of insemination to influence pregnancy rate. Additional observations will be obtained to evaluate whether source of semen influences pregnancy rate when beef heifers are inseminated early and late after the onset of estrus.

### **Implications**

Acceptable pregnancy rates for beef heifers can be achieved with AI between 1 and 36 h after the onset of estrus. The usual practice of AI of animals that are first observed in the estrus in the am, in the pm, and AI of animals first observed in estrus in the pm, in the am (am/pm rule), is very adequate. Beef cows ovulate an average of 31 h after the onset of estrus. Thus when the onset of estrus is accurately determined by radiotelemetry, AI of heifers at 16 to 20 hours after the onset of estrus may be optimal for maximal pregnancy rates. Additional research is needed to determine if the fertility of individual bulls varies with time of insemination.

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