Effect of antral follicle count on time intervals to estrus and ovulation in crossbred beef heifers.

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Introduction

Estrus synchronization is an effective way for beef producers to shorten their calving season and wean larger calves. Fixed-time AI (FTAI) is a specific synchronization protocol meant to eliminate the need for estrus detection. The success of FTAI relies on response to the protocol, specifically regarding estrus and ovulation.

Antral follicle count (AFC) has been found to be correlated to ovarian reserve and other reproductive traits. It is understood that Low AFC heifers have greater circulating levels of gonadotropins [1,2] and lower serum progesterone levels [1,3] when compared to High AFC animals.

Based on these findings, AFC may affect response to FTAI protocols. Therefore AFC may be utilized to tailor FTAI protocols and optimize response.

Objective

To determine the impact of AFC classification on response to FTAI synchronization protocol by measuring time to estrus (TTE), and time to ovulation (TTO) in beef heifers.

Materials & Methods

All procedures were approved by the NMSU Institutional Animal Care and Use Committee.

Figure 1. 7 d Co-synch + CIDR Heifer FTAI Protocol

25 crossbred heifers (13-15 mo. old) were classified by AFC and utilized in two experiments.

Groups were classified as High at ≥ 25 antral follicles (n=10), Moderate from 16-24 antral follicles (n=7), and Low at ≤ 15 (n=8).

- TTE was defined as time from administration of $PG_{F2\alpha}$ to standing estrus.
- TTO was defined as time from administration of $PG_{F2\alpha}$ to ovulation.

Experiment 1

- Heifers subjected to FTAI protocol (Fig. 1)
- Heifers monitored every 3 h after $PG_{F2\alpha}$ administration for standing estrus
- Heifers examined for ovulation at 12 and 18 h post estrus and every 3 h thereafter

Materials & Methods (cont.)

Experiment 2

- Heifers subjected to FTAI protocol (Fig. 1)
- Heifers monitored every 3 h after $PG_{F2\alpha}$ administration for standing estrus
- Heifers placed with bulls at a 1 to 13 ratio for 90 d
- Pregnancy diagnosed 28 d after bull was removed

TTE and TTO between groups was analyzed using the GLM procedure of SAS with AFC as a fixed effect. P-values ≤ 0.05 were considered significant.

Results

Experiment 1: Time to Estrus and Ovulation among Animals with Differing AFC

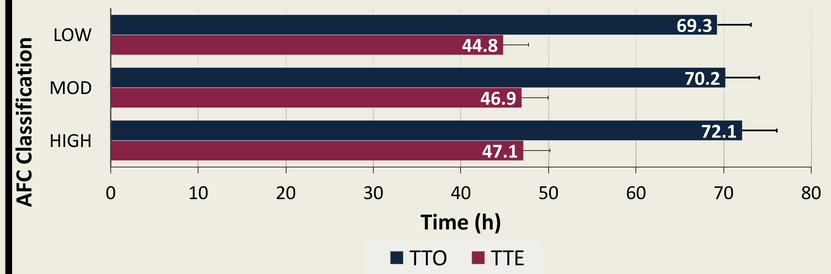

Figure 2. TTE was similar among groups (*P*=0.96). TTO was also similar among groups (*P*=0.90).

Experiment 2: Time to Estrus among Animals with Differing AFC

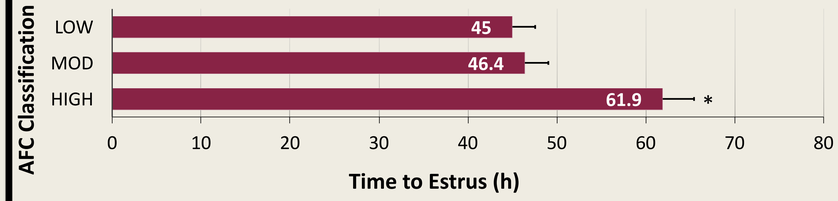

Figure 3. TTE was greater (*P*=0.04) in the HIGH group than in the LOW or MOD groups.

Discussion

- Differences in TTE results between Experiment 1 and Experiment 2 may be due to increased reproductive function as heifers continued to mature.
- An increased number of estrous cycles prior to breeding has been reported to improve pregnancy rate [4] and may effect an animal's ability to display visible estrus.
- Longer TTE in High AFC heifers may be due to lower circulating gonadotropin and therefore decreased intrafollicular E_2 compared to Low AFC [1,2,3].

Conclusion

- The results indicate that there is potential for alterations to synchronization protocols based on AFC classification in order to optimize animal response and achieve greater pregnancy success.
- Additional research is needed to corroborate these results and inform the creation of differing FTAI protocols based on AFC.

References

1. Ireland et al., 2007. Follicle numbers are highly repeatable within individual animals but are inversely correlated with FSH concentrations and the proportion of good-quality embryos after ovarian stimulation in cattle. Hum Reprod. 22:1687–1695.
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4. Byerley et al., 1987. Pregnancy rates of beef heifers bred either on puberal or third estrus. J. Anim. Sci. 65(3):645-650.