

# Comparison of Synchrony Rates of *Bos taurus* and *Bos indicus*-Type Females Using CIDR Devices in Combination with Prostaglandin and ECP or GnRH

W.A. Whitworth<sup>1</sup>, T.G. Montgomery<sup>1</sup>, S.A. Gunter<sup>2</sup>, and K.P. Coffey<sup>3</sup>

## Story in Brief

Differences in estrous synchrony rates between *Bos indicus* (Beefmaster crossbred; Trial 1) and *Bos taurus* (Gelbvieh X Angus; Trial 2) heifers were evaluated when females were synchronized using controlled internal drug release (CIDR) progesterone inserts plus injections of either estradiol cypionate (ECP) or gonadotropin releasing hormone (GnRH) at the time of CIDR insertion. All animals in both trials were given prostaglandin F2 $\alpha$  (PGF) at CIDR removal and an injection of ECP one day later. In trial 1, ECP-treated heifers showed estrus earlier than GnRH treated heifers ( $P < 0.05$ ), but there were no differences in overall synchrony rates. In trial 2, there were no differences in either synchrony rate or time to onset of estrus. When comparing the two breed types, the *Bos taurus* heifers had a greater synchrony rate and exhibited estrus earlier than *Bos indicus* heifers. These results could be explained by season (winter) as *Bos indicus* cattle tend to be long day breeders. Also, the heifers in trial 2 were heavier at breeding than those in trial 1 (852.9 lb vs. 757.2 lb;  $P < 0.05$ ).

## Introduction

In order for large scale artificial insemination to be a viable alternative to natural service, synchronization of females is imperative to reduce time and labor costs. The results of a synchronization protocol must be predictable, repeatable, and provide for a tightly synchronized estrous period to be beneficial to the beef cattle producer. Many different synchronization protocols have been successfully used in beef females. Commonly, a source of progesterone is administered in an effort to suppress the induction of the ovulatory surge of luteinizing hormone (Bo et al., 1994). A protocol that provides sustained progesterone levels, such as placement of a CIDR insert into the female's reproductive tract, is needed to properly suppress ovulation.

Recent research has indicated addition of products that synchronize follicular wave emergence would benefit current protocols by causing synchronous ovulation when the suppressive effect of progesterone is removed (Martinez et al., 2000). Treatments successfully used to synchronize wave emergence have included GnRH, estradiol-17 $\beta$ , and estradiol cypionate (ECP) (Pancarci et al., 2002). The objectives of the current study were to determine the effectiveness of GnRH and ECP in hastening the onset of estrus in heifers and to compare treatment responses between *Bos taurus* and *Bos indicus* females.

## Experimental Procedures

Two trials were conducted at the Southeast Research and Extension Center in Monticello. Both trials incorporated similar treatment comparisons; although, different animal models were used. Trial one consisted of fall born nulliparous Beefmaster sired females ( $n = 23$ ; 13 to 18 mo old), synchronized and inseminated in December. Trial two consisted of Gelbvieh X Angus crossbred heifers ( $n = 39$ ; 12 to 15 mo old) which were synchronized and

inseminated in May for spring calves. Heifers within trials were randomly assigned to one of two synchronization treatments. The treatment comparison evaluated the effectiveness of a synchronization protocol incorporating the use of GnRH into a CIDR protocol which used prostaglandin and estradiol cypionate. Females in treatment 1 (GnRH) received a CIDR insert and an injection of GnRH (100 Fg) on d 0. Prostaglandin F2 $\alpha$  (25 mg) was administered and CIDRs removed on d 7. An injection of estradiol cypionate (0.25 mg) was given 24 to 30 h after CIDR removal. Females in Treatment 2 (ECP) were treated identically except they received a 2 mg injection of estradiol cypionate on d 0 rather GnRH. Females were inseminated approximately 12 h after estrus and efficacy of each protocol was based on synchrony rate. Data were analyzed using the analysis of variance procedures of SAS (SAS Institute, Inc., Cary, NC) with animal as the experimental unit.

## Results and Discussion

There were no differences among treatment groups in synchrony rate during trial 1 (GnRH = 72.7%; ECP = 75%; Table 1). However, time to observed estrus from the second ECP shot was affected by treatment ( $P < 0.05$ ). Beefmaster heifers which receiving 2 mg ECP at the time of CIDR insertion had 12-h shorter ( $P < 0.05$ ) time to estrus onset. This is in contrast to trial two where there were no treatment differences to time of estrus onset ( $P = 0.1$ ). In trial 2, all of the Gelbvieh X Angus crossbred heifers responded to synchronization and showed standing estrus within 40 h of the second ECP injection. When comparing onset of estrus from time of second ECP injection across trials, heifers which received ECP at CIDR insertion came into heat earlier ( $P < 0.05$ ) with no difference overall in synchrony rate.

In comparing the two trials, there were differences ( $P < 0.05$ ) in the time to estrus onset between the two breed types (Table 1). Additionally, the *Bos taurus* heifers in trial 2 showed more positive response to synchronization than their *Bos indicus* counterparts in

<sup>1</sup> University of Arkansas, Monticello

<sup>2</sup> Southside Research and Extension Center, Hope, AR

<sup>3</sup> Department of Animal Science, Fayetteville

trial 1 (100% synchrony vs. 73.9% synchrony,  $P < 0.05$ ). This may be due to the age of the heifers, seasonality and that the *Bos indicus* heifers may not have attained body size or hypothalamic secretions necessary to cycle regularly. In ideal situations, heifers should weigh 65% of their mature weight at the time of their first breeding. The Beefmaster heifers came from a herd where the average mature female weight is approximately 1350 lb. Ideally, the average weight of the heifers at the time of insemination should have been 877 lb. Instead, these heifers averaged 757.2 lb, indicating that these heifers may simply not have been heavy enough to breed.

Brahman and Brahman-based cattle do not attain puberty as early as *Bos taurus* cattle (Randel, 1994). Often, this breed type does not attain puberty in sufficient time to calve at 2 yr of age. Additionally, it has been documented that *Bos indicus* cattle tend to be long day breeders and thus exhibit reduced conception rates during the winter months. Anestrus is common during winter months in *Bos indicus* cattle, as is increased incidence of quiet ovulation.

## Implications

Addition of ECP or GnRH to currently used CIDR protocols functions to tighten estrous synchrony in bovine females. The use of estradiol cypionate seems to be more effective in this regard. The *Bos taurus* heifers responded better to the protocols used in this trial than *Bos indicus* heifers, possibly due to seasonality or weight at time of breeding.

## Literature Cited

- Bo, G.A. et al. 1994. *Theriogenology*. 41:1555.  
 Martinez, M.F., et al. 2000. *Theriogenology*. 54:757.  
 Pancarci, S.M., et al. 2002. *J. Dairy Sci.* 85:122.  
 Randel, R.D. 1994. In: M. J. Field and R. S. Sands (Eds). *Factors Affecting Calf Crop*, pp.23. CRC Press, Inc., Boca Raton, FL.

**Table 1: Summary of Synchronization Protocols.**

	Trial one	Trial two	Trial 1 vs. Trial 2
Weights (lb)	757.2	852.9	$P < 0.05$
Synchrony rate	17/23 (73.9%)	39/39 (100%)	$P < 0.05$
GnRH treated	8/11 (72.7%)	20/20 (100%)	
ECP treated	9/12 (75%)	19/19 (100%)	
Average time to estrus (h)	25.47	12.33	$P < 0.05$
GnRH treated	32.00 <sup>b</sup>	14.55	
ECP treated	19.67 <sup>a</sup>	10.00	

<sup>a,b</sup> Numbers with different superscripts differ ( $P < 0.05$ )