

FINAL REPORT – Project # P0038490 (FCEB # 23)

Title: Development of a puberty indication protocol for *Bos indicus*-based heifers in Florida

Principle Investigator: Dr Cliff Lamb and Nicolas DiLorenzo, North Florida Research and Education Center

Relevance to Florida Cattle Industry: Infertility that leads to failure of a cow or heifer to become pregnant and deliver a calf, results in the single largest economic loss of cow-calf production systems. Attainment of puberty in heifers prior to initiation of the breeding season is likely the single most important factor impacting when heifers become pregnant during the breeding season and, subsequently, the lifetime productivity of cows. Therefore, cow-calf producers are in need of management solutions to induce puberty to ensure the future productive potential of replacement heifers as early as possible in order to choose the best replacement heifers. Developing puberty induction strategies for the attainment of puberty in heifers should enhance longevity and lifetime production of FL beef cows.

Objective: To determine if incorporation of puberty induction strategies enhances puberty in heifers prior to initiation of the breeding season and improves reproductive efficiency of Florida beef cattle operations.

Methods: Three hundred and eighty *Bos indicus* beef heifers were assigned to one of three treatments (Figure 1): 1) Control Group (CONT; $n = 133$): Did not receive any treatment during the experiment; 2) No induction (NOIND; $n = 123$); heifers were exposed to estrus synchronization (ES) and artificial insemination (AI) using the 5-day CO-Synch+CIDR protocol; and 3) Induction (IND; $n = 124$); heifers were exposed to a puberty induction protocol consisting of a CIDR implant for 12 days and exposed to ES and AI using the 5-day CO-Synch+CIDR protocol, starting 12 days after the puberty induction protocol. Blood samples were collected at days 0, 10, 22, 34, and 39 to determine cycling status of heifers, based on plasma concentrations of progesterone.

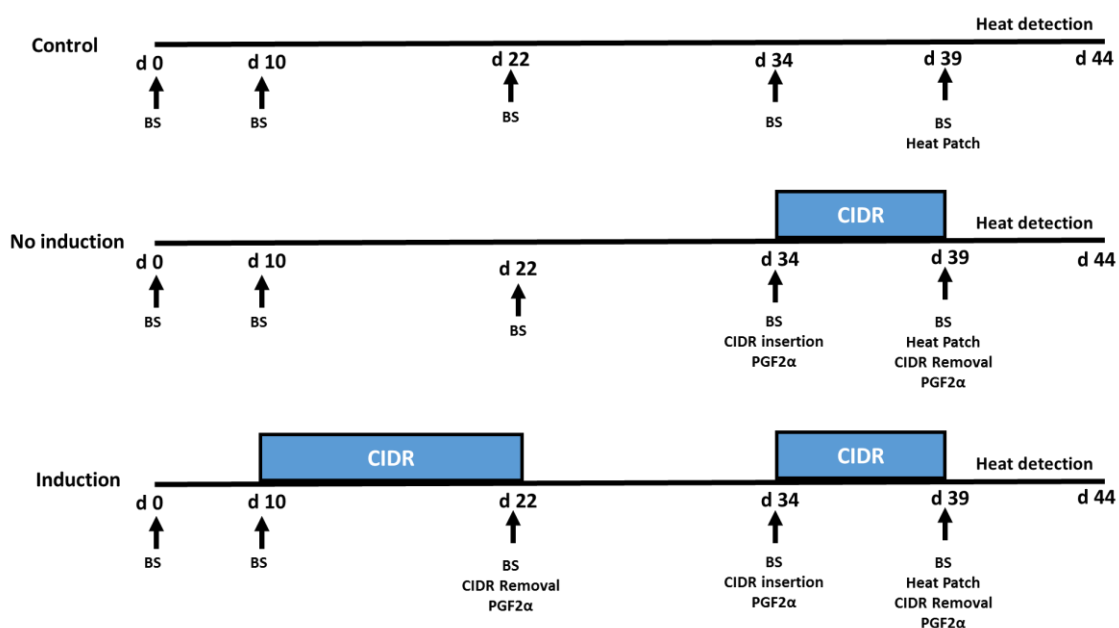


Figure 1. Schematic of treatments.

Results: Overall, body weight (BW) and body condition score (BCS) did not differ among treatments at initiation of the development period; however, BW change for the 40 days from initiation of the experiment until initiation of the breeding season resulted in the heifers assigned to the IND treatment to have greater weight loss than heifers in the CONT and NOIND treatments (Table 1). In addition, heifers assigned to the IND treatment had a greater decrease in BCS than heifers in the CONT and NOIND treatments. In comparison to CONT and NOIND treatments, the IND treatment failed to increase the percentage of heifers that were cycling at 5 days prior to initiation of the breeding season, failed to induce a greater percentage of prepubertal heifers to initiate estrus cycles by initiation of the breeding season, and failed to increase the percentage of heifers observed in estrus during the first 5 days of the breeding season.

Pearson correlation coefficients revealed that the percentage of heifers cycling at initiation of the experiment were associated with BW and with BCS change prior to initiation of the breeding season (Table 2). The percentage of heifers that were cycling 5 days prior to initiation of the breeding season were correlated to BCS change prior to initiation of the breeding season. In addition, the percentage of heifers expressing estrus during the first 5 days of the breeding season was correlated with both BW and BCS at the initiation of the breeding season.

Table 1. Mean age at attainment of puberty for Angus, Brangus, and Braford heifers.

| | Treatment | | |
|--|--------------------------|--------------------------|---------------------------|
| | CONT | NOIND | IND |
| No. of heifers | 133 | 123 | 124 |
| BW at initiation of heifer development | 674 ± 27 | 669 ± 28 | 710 ± 28 |
| BCS at initiation of heifer development | 5.9 ± 0.04 | 5.9 ± 0.04 | 5.9 ± 0.04 |
| BW change for 40 days prior to breeding season | 13.3 ± 27.4 ^a | 13.1 ± 28.5 ^a | -38.7 ± 28.3 ^b |
| BCS change for 40 days prior to breeding season | -0.3 ± 0.04 ^a | -0.3 ± 0.04 ^a | -0.4 ± 0.04 ^b |
| % cycling at initiation of treatments | 32 | 32 | 47 |
| % cycling 5 days prior to initiation of breeding season | 34 | 34 | 41 |
| % of noncycling heifers induced to cycle by treatment | 24 | 24 | 29 |
| % expressing estrus during first 5 d of breeding season | 9 | 14 | 17 |
| % noncycling heifers induced to express estrus during first 5 d of breeding season | 7 | 11 | 11 |

^{a,b} Means within a row differ (P < 0.05)

Table 2. Pearson correlation coefficients among feed efficiency and fertility traits for replacement beef heifers.

| Item ¹ | Initial BW | Initial BCS | Final BW | Final BCS | BW change | BCS change |
|---|--------------------|---------------------------------|------------------------------------|---------------------------------|-------------------|----------------------------------|
| % cycling at initiation of treatments | -0.02675 0.6046 | 0.10193 0.0471 | 0.09392 0.0693 | -0.01796 0.7275 | 0.04110 0.4293 | -0.10738 0.0367 |
| % cycling 5 days prior to initiation of breeding season | -0.02891 0.5768 | 0.08406 0.1027 | 0.00422 0.9351 | -0.02954 0.5670 | 0.03167 0.5432 | -0.09913 0.0542 |
| % expressing estrus during first 5 d of breeding season | 0.01049 0.8391 | 0.05633 0.2734 | 0.21009 <.0001 | 0.15614 0.0023 | 0.02083 0.6888 | 0.06290 0.2218 |

¹BW = Body weight; BCS = body condition score

Conclusion: Use of a puberty induction protocol in *Bos indicus* beef replacement heifers failed to increase the percentage of heifers that were pubertal or expressed estrus at initiation of the breeding season; however, key fertility indicators were correlated to BW or BCS change prior to the initiation of the breeding season.

| BUDGET FOR FLORIDA CATTLE ENHANCEMENT FUND APPLICATION | | | | | |
|--|------|------------|--------------------|---|-----------------|
| PROJECT TITLE & FCEB #: Development of a puberty indication protocol for <i>Bos indicus</i> -based heifers in Florida - Project # P0038490 (FCEB # 23) | | | | | |
| DETAILED LINE ITEM DESCRIPTION | QTY | % Complete | TOTAL | EXPLANATION/JUSTIFICATION OF DELIVERABLE | COMPLETION DATE |
| Chemical Analysis-Blood | 1500 | 100% | \$ 6,000.00 | Immolute analysis of P4 samples (5 samples per heifer x 300 heifers x \$4/sample) | 9/01/2017 |
| Ultrasound, materials and supplies to complete the assessment of puberty | 300 | 100% | \$ 6,250.00 | Ultrasounding fees, ultrasounding supplies, miscellaneous materials and supplies needed to complete the assessment of puberty | 9/01/2017 |
| Research Animals (per diem) | 300 | 100% | \$ 17,914.00 | Per diems for access to research animals in order to complete the study | 9/01/2017 |
| Indirect cost (12%) | 1 | 100% | \$ 3,619.68 | Project report detailing research, which may include, findings, future needs, results, conclusions, issues, risks, assessments and all other pertinent information. | 9/01/2017 |
| GRAND TOTAL: (equal to percentage of completion) | | 100% | \$33,783.68 | | |