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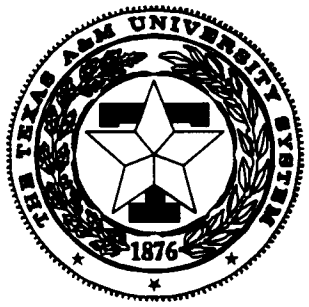

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EFFECTS OF INDUCED HYPOTHYROIDISM OR HYPERTHYROIDISM ON GROWTH AND REPRODUCTIVE PERFORMANCE OF BRAHMAN HEIFERS

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Background. It has been demonstrated that Brahman cattle exhibit seasonal patterns in reproduction with some Brahman cows becoming anestrus during the fall and early winter seasons. In sheep, seasonality is largely controlled by daylength. However, it has been shown that the thyroid gland may play an important role as well. It is not known if the thyroid gland plays a key role in the transition to anestrus observed in *Bos indicus* cattle. Preliminary studies suggest that hyperthyroid Brahman cows had a greater proportion of abnormal estrous cycles.

Thyroid hormones regulate basal metabolism and can alter nutrient requirements by increasing basal expenditure of energy. Hypothyroidism is easily induced in the bovine with potent anti-thyroid compounds that are utilized in human medicine. Improvements in average daily gain and feed efficiency have been observed in hypothyroid steers and heifers. Propylthiouracil (PTU) is one such synthetic compound which has been successful in suppression of thyroid activity. Previous research at the Overton center reported increases in body weight (BW) and body condition score (BCS) when Brahman cows were induced to become hypothyroid via ingestion of PTU. Increases in BW and BCS have been associated with a reduction in age at puberty in beef heifers. Induction of hypothyroidism could result in BW and BCS gains that would stimulate the onset of puberty in heifers.

Manipulation of the endocrine system to alter seasonal patterns in reproduction and enhance growth rate should improve reproductive performance of Brahman cattle. The objectives of this experiment were to evaluate the effects of thyroid manipulation on growth and puberty in Brahman heifers.

Research Findings. Twenty-one prepubertal Brahman heifers (BW=666±16.5 lbs, BCS=5.4±.2, age=498±3.4 days) were utilized to study the effects of thyroid function on growth and reproduction. Seven heifers were controls (C). Seven heifers were induced to become hypothyroid by ingestion of 4 mg/kg BW of 6-n-propyl-2-thiouracil (PTU). Seven heifers were induced to become hyperthyroid by daily injections of triiodothyronine (T3, 1 mg/day). Treatments were administered for 84 days (d) starting on January 22nd, 1996 and followed by an 84 d post-treatment period. BW, BCS, and rectal temperature (RT) were recorded weekly and blood samples were obtained biweekly for hormone analysis. Hyperthyroidism and hypothyroidism were successfully induced in T3 and PTU treated heifers, respectively. During the treatment period PTU heifers gained the most BW and BCS (160±12 lbs; .93±.15 units), C heifers were intermediate (92±12 lbs; .43 .15 units) and T3 heifers the

least (29±12 lbs; -.36±.15 units; P<.05). The increase in BW and BCS in PTU heifers is presumably a consequence of increased energy availability associated with a reduction in the basal metabolic rate. Rectal temperature also decreased (P<.05) in PTU heifers (-3.5±.4°F) as compared to C (-2.2±.4°F) or T3 heifers (-1.4±.4°F) suggesting that the basal metabolic rate was altered in PTU heifers. No heifers exhibited estrus during the treatment period. During the post-treatment period, T3 heifers gained the most BW and BCS (207±13 lbs; 1.14±.13 units), C heifers were intermediate (148±13 lbs; .86±.13 units), and PTU heifers the least (49±13 lbs; -.14±.13 units; P<.05). The reversal in BW and BCS gains observed during the post-treatment period corresponded to periods of transient hypo- and hyperthyroidism in T3 and PTU heifers, respectively. Age and BW at puberty and pregnancy were similar between all treatment groups. T3 heifers were thinner (5.7±.2 units; P<.05) at puberty and pregnancy than PTU heifers (6.6±.2 units). Induction of hypothyroidism resulted in significant increases in BW and BCS during the treatment period, but these increases were not sufficient to alter reproductive performance of Brahman heifers.

It was hypothesized that hypothyroidism would increase BW and BCS during the late winter and early spring and would subsequently hasten the onset of puberty. PTU heifers had elevated average daily gains (1.9 lbs/d) and were optimal (BCS=6.1±.2 units) in BCS during the late winter and early spring. These results suggest that BW gain and BCS are not the sole regulators of age at puberty.

Application. Alteration of thyroid status influences BW and BCS gains via alteration of basal metabolic rate. These changes in metabolism were not sufficient to dramatically affect the reproductive performance of peripubertal heifers and were not successful in induction of puberty during the time period characterized by anestrous in Brahman cows.