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**Interrelationship of Endocrine
and Physiological Events
During the Estrous Cycle
in Brahman Cattle**

Research Center

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LUTEINIZING HORMONE PATTERNS IN OVARIECTOMIZED
BRAHMAN AND HEREFORD COWS BEFORE AND AFTER INJECTION OF
GONADOTROPIN RELEASING HORMONE

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SUMMARY

Luteinizing hormone is released in pulsatile rhythms from the pituitary gland. Although the trend was for lower luteinizing hormone levels in Brahman than in Hereford cows there were no significant differences in mean serum levels, number or magnitude of peaks or pulse height. All animals showed increased serum luteinizing hormone in response to gonadotropin releasing hormone in the first 15 minute collection period. There were no differences in duration of response between breeds. Ovariectomized Brahman cows had significantly lower ($P < 0.005$) serum luteinizing hormone levels during the response period than did Hereford cows. Ovariectomized Brahman cows are less responsive to gonadotropin releasing hormone than are ovariectomized Hereford cows.

OBJECTIVES

As differences in serum luteinizing hormone level at the ovulatory surge, different responses to estrogen, altered timing of ovulation as well as shortened heat periods have been shown in Brahman cattle this research was conducted to determine the relationship between controlling systems for luteinizing hormone. Experiment 1 was conducted to determine if ovariectomized Brahman and Hereford cows have pulsatile serum luteinizing hormone patterns, differ in mean serum luteinizing hormone levels, differ in number and magnitude of luteinizing hormone peaks and differ in serum luteinizing hormone pulse height. Experiment 2 was conducted to determine if ovariectomized Brahman and Hereford cows differ in response to gonadotropin releasing hormone.

PROCEDURES

In Experiment 1 twelve long term ovariectomized cows, 6 Brahman and 6 Hereford, were sampled every 15 minutes for a period of 4 hours. Blood samples were assayed for serum luteinizing hormone levels by radio-

immunoassay. In Experiment 2 eleven long term ovariectomized cows, 6 Brahman and 5 Hereford, were given a 500 μ g intramuscular injection of gonadotropin releasing hormone. These animals were bled at 15 minute intervals for a period of 6 hours. Serum luteinizing hormone was determined by radioimmunoassay.

RESULTS

In Experiment 1 it was concluded that ovariectomized Brahman and Hereford cows have pulsatile luteinizing hormone patterns. A comparison of serum luteinizing hormone levels is shown in Table 1. From the results of this experiment it appears that cyclic release of luteinizing hormone after ovariectomy in Brahman and Hereford cows is not significantly different, but the trend was for mean levels to be greater in Hereford cows than in Brahman cows.

TABLE 1. COMPARISON OF LUTEINIZING HORMONE LEVELS FOR OVARIECTOMIZED BRAHMAN AND HEREFORD COWS.

| | <u>BRAHMAN</u> | <u>HEREFORD</u> |
|--|----------------|-----------------|
| Mean Serum Luteinizing Hormone (ng/ml) | 5.60 | 8.60 |
| Number of Luteinizing Hormone Peaks | 3.00 | 3.33 |
| Magnitude of Luteinizing Hormone Peaks (ng/ml) | 7.85 | 10.45 |
| Luteinizing Hormone Pulse Height (ng/ml) | 4.28 | 6.50 |

In Experiment 2 all animals responded to the 500 μ g injection of gonadotropin releasing hormone within 15 minutes of injection (Figure 1). The mean response for Brahman cows was lower ($P < 0.005$) at 33.96 ± 4.0 ng/ml luteinizing hormone than for Herefords at 67.46 ± 20.2 ng/ml. The peak height for Brahman cows was 93.70 ± 7.0 ng/ml luteinizing hormone and 184.96 ± 67.9 ng/ml for Hereford cows ($P < 0.005$). The response time was similar with 4.60 ± 0.60 hours in Brahman and 5.15 ± 0.60 hours in Hereford cows. These results indicate a lower ability of the pituitary gland of the ovariectomized Brahman cow to respond to gonadotropin releasing hormone as compared to the Hereford cow.

The factors causing Brahman cattle to have smaller corpora lutea, lower progesterone per corpus luteum, lower serum progesterone and a smaller pre-ovulatory surge in luteinizing hormone may be due to a lack of adequate gonadotropic stimulus from the pituitary gland.

RESULTS

In Experiment 1 it was concluded that ovarietomized Brahman and Hereford cows have similar luteinizing hormone patterns. A comparison of serum luteinizing hormone levels is shown in Table 1. From the results of this experiment it appears that cyclic release of luteinizing hormone after ovarietomy in Brahman and Hereford cows is not significantly different, but the trend was for mean levels to be greater in Hereford cows than in Brahman cows.

TABLE 1. COMPARISON OF LUTEINIZING HORMONE LEVELS FOR OVARIECTOMIZED BRAHMAN AND HEREFORD COWS.

| HEREFORD | BRAHMAN | |
|----------|---------|--|
| 8.60 | 5.60 | Mean Serum Luteinizing Hormone (ng/ml) |
| 3.33 | 3.00 | Number of Luteinizing Hormone Peaks |
| 10.45 | 7.85 | Magnitude of Luteinizing Hormone Peaks (ng/ml) |
| 6.50 | 4.38 | Luteinizing Hormone Pulse Height (ng/ml) |

In Experiment 2 all animals responded to the 500 µg injection of gonadotropin releasing hormone within 15 minutes of injection (Figure 1). The mean response for Brahman cows was lower ($P < 0.005$) at 33.96 ± 4.0 ng/ml luteinizing hormone than for Herefords at 67.46 ± 20.5 ng/ml. The peak height for Brahman cows was 93.70 ± 17.0 ng/ml luteinizing hormone and 194.96 ± 67.9 ng/ml for Hereford cows ($P < 0.005$). The response time was similar with 4.60 ± 0.60 hours in Brahman and 5.15 ± 0.60 hours in Hereford cows. These results indicate a lower ability of the pituitary gland of the ovarietomized Brahman cow to respond to gonadotropin releasing hormone as compared to the Hereford cow.

MEAN LH RESPONSE OF OVARIECTOMIZED BRAHMAN
AND HEREFORD CATTLE TO 500 µg GnRH

Figure 1. Mean LH response of ovariectomized Brahman and Hereford cattle to 500 µg GnRH (the shaded area represents the separation between standard errors).

