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AN EXPLANATION FOR LOWERED CONCEPTION RATES IN VIRGIN HEIFERS

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SUMMARY

In an attempt to determine why virgin heifers have a lower conception rate, 19 prepuberal Simmental x Brahman-Hereford heifers were allotted by weight (11/25/81) into two groups and were fed to reach a target weight of 725 lbs by 3/1/82. Sterile heat check bulls were maintained with each group throughout the trial to aid in estrus detection. Weekly blood samples were taken to determine any pre-estrus rise in serum progesterone. Daily blood samples were taken on days 1 through 14 of the first and the second estrous cycle (day 0 = standing estrous behavior) to determine serum progesterone concentrations. Once the serum progesterone concentrations were determined by radioimmunoassay, three distinct groups of heifers became apparent: normal heifers (n=4) exhibited two normal estrous cycle lengths (19-22 days, first estrous cycle; 21 days, second estrous cycle) and had midcycle progesterone concentrations indicative of corpus luteum (CL) formation; abnormal heifers (n=4) exhibited variable estrous cycle lengths (7-22 days, first estrous cycle; 13 to 23 days, second estrous cycle) with variable serum progesterone concentrations during each estrous cycle; and low progesterone heifers (n=11) also had highly variable estrous cycle lengths (16-31 days, first estrous cycle; 7 greater than 35 days, second estrous cycle) and standing estrous behavior which was not followed by any elevation in serum progesterone concentrations. There were no differences between the three groups in weight at first observed estrus, age at first estrus, or average daily gain from the start of the trial to first estrus. Of the heifers showing elevated serum progesterone during the estrous cycle (both normal and abnormal groups), seven out of eight had a progesterone rise detected in the weekly samples prior to the first standing estrus. None of the low progesterone heifers showed this pre-estrus progesterone elevation. Both normal and abnormal heifers released more progesterone during the second estrous cycle than during the first estrous cycle, while progesterone concentrations remained basal during both the first and the second estrous cycle in the low progesterone heifers. In addition, one out of four of the abnormal heifers during the

first estrus and two out of four of the abnormal heifers during second estrus showed standing estrus behavior while exhibiting elevated serum progesterone concentrations.

It can be concluded from this study that heifers which form competent CL following puberal estrus show a rise in serum progesterone prior to first estrus; and, while numerous heifers showed standing estrus behavior, less than 50% had elevated progesterone concentrations and less than 25% had "normal" progesterone concentrations following the first puberal estrus.

OBJECTIVES

It has been a common practice of livestock producers not to breed a heifer during her first estrous cycle due to confirmed low conception rates. Numerous studies with sheep have indicated that just prior to the first puberal estrous cycle, serum progesterone concentrations are elevated. Direct ovarian examination has shown that this rise in serum progesterone is the result of luteal tissue formation without previous standing estrous behavior and often without ovulation. Therefore, the objectives of this experiment were: (1) to determine if serum progesterone is elevated in the bovine prior to first estrus, and (2) to compare the competency of the CL formed following first standing estrous behavior with the CL formed following the second standing estrus.

PROCEDURE

Nineteen prepuberal Simmental x Brahman-Hereford heifers were placed into one of two feeding groups based on pretrial weight (11/25/81): heifers which weighed 540 lbs or less were fed 12.1 lbs/head/day of a concentrate diet (corn + cottonseed meal) plus Coastal bermudagrass hay free choice, calculated to give 2.5 lbs/gain/day; heifers which weighed more than 540 lbs were fed 8.2 lbs/head/day of the concentrate diet plus Coastal hay free choice. Both groups were fed to achieve a target weight of 725 lbs by 3/1/82. Sterile heat check bulls, equipped with chin ball markers, were maintained with each group throughout the trial to aid in estrous detection. Progesterone concentrations were determined by radioimmunoassay in weekly blood samples taken prior to the onset of first standing estrous behavior and in daily samples taken on days 1 through 14

of the first and the second estrous cycle (day 0 = standing estrus).

RESULTS

When the serum progesterone concentrations were determined, three distinct groups of heifers became apparent: heifers classified as normal (n=4) exhibited two normal estrous cycle lengths and had midcycle progesterone concentrations indicate of competent CL formation; heifers classified as abnormal (n=4) exhibited variable estrous cycle lengths with inconsistent progesterone concentrations during the cycle indicative of an asynchrony in the hypothalamic-pituitary-ovarian communication; and heifers classified as low progesterone had extremely variable estrous cycle lengths and no elevation in serum progesterone concentrations following an observed standing estrus. There were no differences between the three groups in weight at first estrus, age at first estrus or average daily gain from the start of the trial to first estrus (Table 1). There were also no statistical differences in estrous cycle lengths between the three groups (Table 2), although it should be noted that 27% of the low progesterone heifers had first estrous cycle lengths of greater than 25 days while 50% of the abnormal heifers had first estrous cycle lengths of less than 15 days. Serum progesterone concentrations showed the most striking differences between the three groups (Figure 1). Of the heifers which formed some sort of luteal tissue following first standing estrus, seven out of eight had elevated serum progesterone concentrations prior to first estrus, while none of the low progesterone heifers exhibited this elevation in progesterone prior to first standing estrus. Both of the normal and abnormal heifers were capable of releasing more progesterone during the second than during the first estrous cycle, while the progesterone concentration remained basal after the first and the second standing estrus in low progesterone heifers. In addition, one out of four of the abnormal heifers at the first estrus and two out of four of the abnormal heifers at the second estrus showed standing estrous behavior while serum progesterone concentrations were elevated.

These results support the previous work done in sheep that there is a rise in serum progesterone concentrations prior to the first estrus, but it is only elevated in those heifers which form luteal tissue after that first puberal estrus. Moreover, less than 50% of the heifers which showed

estrous behavior formed any sort of luteal tissue and less than 25% of these heifers had normal progesterone concentrations which could result in pregnancy maintenance.

Table 1. Puberal estrous measurements

Group	n	Weight at 1st estrus	Age at 1st estrus	Average daily gain to 1st estrus
Normal	4	636 ± 25.8 lbs	324 ± 7.5 d	1.5 ± .17 lbs
Abnormal	4	580 ± 24.0 lbs	323 ± 17.4 d	2.0 ± .58 lbs
Low progesterone	11	618 ± 17.0 lbs	319 ± 7.6 d	1.8 ± .21 lbs

Table 2. Puberal cycle lengths

Group	1st estrous cycle		2nd estrous cycle	
	$\bar{x}$ ± SEM	Range	$\bar{x}$ ± SEM	Range
Normal	20.5 ± .4 d	19-22 d	21.0 ± 0.0	21 d
Abnormal	15.5 ± 2.2 d	7-22 d	18.3 ± 1.4	13- 23 d
Low progesterone	21.9 ± 2.0 d	10-31 d	23.6 ± 3.5	7->35 d

FIGURE 1. ESTROUS CYCLE PROGESTERONE CONCENTRATION