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EFFECTS OF DIETARY FAT ON HORMONE AND METABOLITE CONCENTRATIONS AND FOLLICULAR DEVELOPMENT IN UNILATERAL OVARIECTOMIZED ESTROUS CYCLING BRAHMAN COWS

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Background. Supplementation of fats to cows has been reported to alter many reproductive physiological mechanisms. It may be possible that by altering these mechanisms one can improve reproductive performance in cows supplemented with fats. Cows supplemented with fats have increased serum progesterone and serum and follicular fluid cholesterol concentrations. Supplementation of fats to postpartum cows decreased the number of small and increased the number and size of large follicles. Fat supplementation increased the number of early postpartum cows with luteal activity by 18%. Furthermore, fatty acid supplementation of postpartum cows increased progesterone concentrations after the first postpartum ovulation. It has been reported that superovulated cows supplemented with fats had increased populations of medium sized follicles, however, there was no improvement in the number of embryos recovered. The objectives of this study were to evaluate the effects of supplementary fats on circulating progesterone, cholesterol and triglyceride concentrations, follicular development and in vitro progesterone secretion in unilateral ovariectomized estrous cycling cows.

Research Findings. Nineteen multiparous estrous cycling, unilateral ovariectomized Brahman cows were randomly allotted to receive either 3.74% (n = 9) or 5.20% (n = 10) dietary fat in their diets. Rations were formulated using Coastal bermudagrass hay, corn, soybean meal and rice bran. The control ration contained no rice bran. Cows were fed and bled twice daily from d 1 of the first estrous cycle until the first dominant follicle of the second estrous cycle reached 8 mm as detected by daily ultrasonography (Aloka 210, linear array transducer, 5 MHZ rectal probe). Once the follicle reached 8 mm the CL was harvested, weighed, minced and cultured for 4 h with 0, 1, 10 and 100 ng of LH. Serum cholesterol was higher ($P < .05$) on d 7 and numerically higher on d 14 and 21 of the first estrous cycle in treated cows. Serum triglyceride concentrations were not affected ($P > .10$) by treatment during the first or second estrous cycle. Serum progesterone was similar ($P > .10$) during the first estrous cycle, but higher ($P < .01$) in treated cows (4.6 ± .41 ng/mL) over controls (2.7 ± .37 ng/mL) during the second estrous cycle. Follicular populations were greater ($P < .009$) in treated cows when the ovulatory follicular wave of the first estrous cycle emerged and during the first follicular wave of the second estrous cycle. Results from the CL culture are shown in table 1.

Table 1. Effects of dietary fats on CL function in vitro (LSM±SEM).

Parameter	3.74% Fat (n=4)	5.20% Fat (n=5)
CL Weights (g)	1.96±.24	2.22±.26
0 ng of LH	187.9±21.1	188.9±18.9
1 ng of LH	212.5±10.0	216.4±17.0
10 ng of LH	224.3±19.2	213.9±17.2
100 ng of LH	218.9±27.7	227.5±24.8

Rows with different superscripts differ $P < .05$.

Application. Results from this study confirm previous reports that supplementation of fats to estrous cycling beef cows increases serum cholesterol concentrations as early as d 7 after treatment began. Differences in serum progesterone concentrations during the second estrous cycle and similarities in *in vitro* progesterone secretion between treated and control cows, support the hypothesis that cows supplemented with fats had higher serum progesterone concentrations due to a decrease in circulating progesterone clearance rate rather than an increase in progesterone secretion by the corpus luteum. Follicular data in this study contradict previous findings in which differences in follicular populations did not occur until after the third week of supplementing with fats. In this study with cows beginning the treatment on d 1 of the estrous cycle, follicular populations increased by the time the ovulatory follicular wave emerged. Therefore, it can be suggested from these results that a diet with 5.20% fat, based on rice bran, may increase follicular populations within 2-3 weeks of feeding.