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DOSE RESPONSE EFFECT OF PRENATAL TRENBOLONE ACETATE TREATMENT ON THYROID HORMONE CONCENTRATIONS AND GROWTH AND REPRODUCTIVE PERFORMANCE OF BEEF COWS

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Background. About 70% of the total annual energy used to produce beef cattle is used by the cow herd, with the remainder used by market animals from weaning to slaughter. Additionally, about 70% of the energy used by the cow herd is needed to meet maintenance energy requirements, with the remainder used to meet energy requirements for pregnancy and lactation. Therefore, the energy requirements for cow maintenance command about 50% of the annual feed energy budget used to produce beef. One strategy that has the potential to reduce the maintenance energy requirements of the cow herd, is the use of trenbolone acetate (**TBA**) to modify a cow's metabolic rate. Trenbolone acetate is a synthetic anabolic steroid with androgenic properties that is marketed to promote growth in cattle. Australian research has shown that body weight (**BW**) losses of steers fed poor-quality forages were reduced when steers were implanted with TBA. Moreover, studies at Oklahoma State University with steers grazing dormant tallgrass prairie found that TBA-implanted steers lost less BW compared to nonimplanted steers when 200, but not 80 or 140 mg doses of TBA were used, suggesting that responses to TBA implants were dose dependant. Subsequent research has demonstrated that TBA reduced fasting metabolism and the energetic cost of muscle protein turnover rates in steers fed poor-quality forage. Research conducted at Washington State University found that TBA-implanted cows gained faster during the last 70 days of gestation than nonimplanted cows (1 vs .5 kg/day), with no subsequent detrimental affects on calving difficulty or cow fertility.

Based on these research findings, a dose-response study was conducted with pregnant Simmental cows to determine the optimal dose of TBA needed to minimize feed costs during late gestation. Specifically, the objectives of this study were to determine the effects of TBA on feed intake and performance responses during late gestation and to examine the subsequent effects of TBA on calf health and performance and cow reproductive efficiency.

Research Findings. Fifty-six pregnant Simmental cows were randomly assigned to one of four TBA implant treatments (0, 0.4, 0.8, and 1.2 mg TBA/kg BW) on day 104 of gestation. Cows were implanted at the start of the trial and again 70 days later with the same dose of TBA. A diet containing 65% whole corn, 20% chopped hay, 10% protein/mineral supplement, and 5% molasses was limit fed individually using Calan electronic gate feeders. Cow BW and body condition scores

(BCS) were obtained at 14-day intervals and feed intakes adjusted to target a BCS of 5 in nonimplanted cows at calving. Blood samples were collected at 14-d intervals and plasma analyzed for triiodothyronine (T3), thyroxine (T4) and blood urea nitrogen concentrations. At parturition, calving difficulty and calf vigor scores were assigned. Three weeks prior to the beginning of the breeding season blood samples were taken weekly and analysis of plasma progesterone concentrations were used to determine ovarian activity (>1 ng/mL for 2 consecutive weeks). Rectal palpation was used to determine pregnancy rates 42 days after breeding.

Feed intake throughout the last 178 days of gestation was not affected by dose of TBA used and averaged 17.6 ± .13 lb/day. Cow BW and BCS at calving were also not affected by TBA treatment and averaged 1238.6 ± 13.2 lb and 4.7 ± 1, respectively. Birth weights, calf vigor scores and weaning weights of calves were not affected by TBA and averaged 96.4 ± 1.5, 1.3 ± .2, and 523.6 ± 8.8. However, calving difficulty scores were increased as dose of prenatal TBA was increased (Table 1). Prenatal treatment with TBA also reduced the proportion of cows exhibiting estrus prior to breeding as well as the 42-d postbreeding pregnancy rates (Table 1).

Table 1. Effects of TBA dose during gestation on calving difficulty scores and subsequent pregnancy rates of Simmental cows.

Treatment (mg TBA/kg)	Calving Difficulty*	Estrous Cycling, %	Pregnancy Rates, %
0	1.1	77	92
0.4	1.0	77	85
0.8	1.4	38	69
1.2	1.9	57	36

* Calving difficulty score based on a scale of 1 to 4: 1 = no assistance, and 4 = very difficult pull or cesarean section.

Plasma T3 and T4 concentrations throughout gestation were lower in cows implanted with1.2 mg TBA/kg compared to controls, with cows implanted with 0.4 and 0.8 mg TBA/kg being intermediate. There were no differences in blood urea nitrogen concentrations throughout gestation due to TBA treatment.

Applications. The findings of this study indicate that prenatal TBA treatment did not reduce feed intake needed to maintain BW and BCS of cows during late gestation. Moreover, prenatal TBA treatment did not affect the subsequent growth rate of calves from birth to weaning. However, prenatal TBA treatment did negatively affect calf dystocia and cow reproductive efficiency in a dose dependant manner. Therefore, implanting pregnant cows with TBA should not be used as a strategy to reduce feed costs during late gestation due to the detrimental effects on reproduction.