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LEPTIN AND IGF-I AS METABOLIC INDICATORS OF REPRODUCTIVE PERFORMANCE

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Background. Timely estrous cyclicity of heifers and cows is crucial to the success of a beef enterprise. After the initial parturition, females are expected to maintain a yearly calving interval, which means that the female has approximately 80 d from parturition to her next conception. Nutrition plays a critical role in postpartum rebreeding. Ionophore antibiotics such as monensin and lasalocid have been successfully utilized to alter reproductive performance in prepuberal heifers and postpartum cows. Ionophores improve feed efficiency in cattle by increasing the propionate to acetate ratio and improve nitrogen utilization by increasing dietary protein flow; therefore, the animal receives increased energy and increased dietary protein. Recently, insulin-like growth factor-I (IGF-I) and leptin have been suggested as potential mediators of the effects of nutrition on reproductive performance. The alteration of nutritional status by an ionophore may lead to changes in metabolic hormones such as IGF-I and leptin. The objectives of this study were to 1) characterize and compare serum concentrations of IGF-I and leptin prior to return to estrus, 2) determine the effects of feeding an ionophore on return to estrus and concentrations of IGF-I and leptin, and 3) correlate concentrations of IGF-I and leptin with return to estrus.

Research Findings. Forty-one purebred Brahman cows were assigned to control (C; n=20) or lasalocid (L; n=21). Treatment began 21 d prior to expected calving. Cows were fed 3 lbs/hd/d of an 11:1 corn:soybean meal ration with the L group receiving 200 mg/hd/d lasalocid. Cows and calves were weighed and cow body condition assessed at calving and at 28-d intervals thereafter. Blood samples were collected weekly prepartum, at parturition, and twice weekly thereafter. Sterile marker bulls were maintained with the cows for estrous detection. Serum samples were assayed for progesterone, IGF-I, and leptin concentration. Treatment ended after completion of a normal estrous cycle, and cows removed from treatment were placed with a fertile bull equipped with a chinball marker. There were no treatment differences in calving date, calf sex, cow BW, BCS, calf BW, cow and calf ADG, P4, IGF-I, or leptin. Postpartum interval (PPI) was unaffected by treatment; however, a greater percentage ($P < .05$) of L cows conceived by 90 d postpartum (43% L vs 15% C; Figure 1). First service conception rate tended ($P < .08$) to be greater in L than C (68% L vs 40% C), and pregnancy rate was numerically greater ($P < .12$) in L (86% L vs 65% C; Figure 2). Cows were grouped by PPI into short (S; n=8; 30-37 d) and

long (L; n=8; 78-132d) groups. There was a group by time interaction ($P < .10$) with S cows having higher concentrations of leptin for the first 40 d postpartum. Prior to calving there were significant negative correlations between leptin and P4 ($P < .0001$; $r = -.36$) and IGF-I and P4 ($P < .01$; $r = -.20$), meaning that for every one ng increase in leptin or IGF-I, there was a corresponding decrease of .36 and .20 ng of P4, respectively. At calving, there was a positive correlation between leptin and IGF-I ($P < .04$; $r = .320$) such that with every 1 ng increase in leptin, IGF-I increased by .32 ng. During the postpartum period, there was a negative correlation between leptin and PPI ($P < .0001$; $r = -.27$), and positive correlations between leptin and cow body weight ($P < .02$; $r = .36$) and leptin and cow body condition ($P < .06$; $r = .29$). Therefore, increased leptin concentration was associated with decreased PPI and increased leptin concentration was significantly associated with increased nutritional status of the cow.

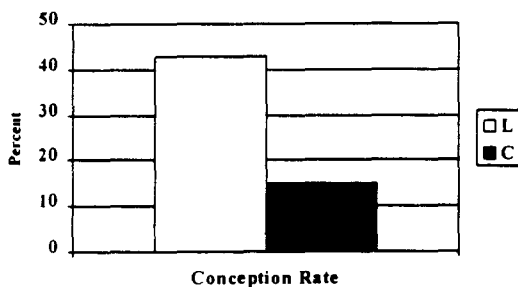


Fig. 1. Conception rate by 90 d postpartum.

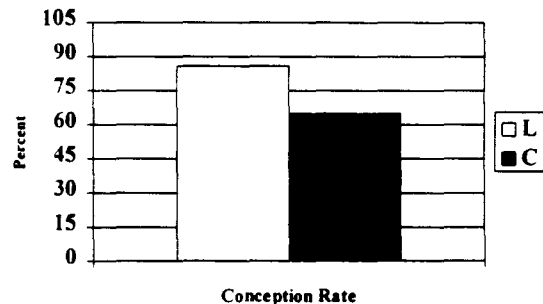


Fig. 2. Conception rate at the end of the breeding season.

Application. These results indicate that feeding an ionophore prior to calving and throughout the postpartum period may increase the number of cows that rebreed to calve at a yearly interval. Concentrations of leptin are positively correlated with IGF-I, cow body weight and body condition, and negatively correlated with PPI. Nutritional management to increase leptin concentrations postpartum may result in reduced PPI.