

INFLUENCE OF NUTRITION ON LUTEINIZING HORMONE AND FOLLICLE STIMULATING HORMONE IN BEEF COWS

M.L. Looper¹, J.A. Vizcarra² and R.P. Wettemann³

Story in Brief

Ovariectomized Hereford and Angus x Hereford cows were used to determine the effect of body energy stores on concentrations of luteinizing hormone (LH) and follicle stimulating hormone (FSH) in serum. Cows were fed to achieve either thin (n=4) or moderate (n=4) body condition. On d 0, blood serum was collected at 10 minute intervals for 8 hours, then moderate cows were randomly assigned to receive either a restricted diet or maintenance diet for 6 days (d 1 through 6). Blood samples were collected at 10 minute intervals for 8 hours from moderate cows on d 3 and 6, and concentrations of LH and FSH were quantified in blood serum on d 0, 3 and 6. Moderate conditioned cows had greater LH concentrations than thin cows (6.84 vs 3.56 ng/ml, respectively). FSH concentrations were greater for moderate cows (2.11 ng/ml) than thin cows (1.58 ng/ml). Short-term feed restriction (6 d) decreased LH concentration and increased FSH concentrations on d 6 in moderate cows. Long-term feed deprivation decreases both LH and FSH concentrations in serum, however, acute restriction of nutrition tends to decrease LH and increase FSH concentrations after 6 days in ovariectomized beef cows.

(Key Words: Nutritional Deprivation, LH, FSH, Beef Cows.)

Introduction

Inadequate nutrition is associated with the suppression of gonadal activity in many species. Long-term (26 wk), nutritionally restricted cows have reduced concentrations and fewer pulses of LH than cows in moderate body condition (Richards et al., 1989). Dietary energy restriction inhibited LH secretion in ovariectomized heifers (Kurz et al., 1990).

Although acute feed restriction decreases the concentration of LH in blood of male monkeys (Schreihof et al., 1993), its effect on gonadotropins in cattle has not been established. Therefore, the objectives of this study were 1) to determine the effect of body energy stores on concentrations of LH and FSH in ovariectomized beef cows, and 2) to examine the effect of acute feed restriction on secretion of LH and FSH in cows.

¹Graduate Assistant ²Research Associate ³Regents Professor

Materials and Methods

Ovariectomized Hereford and Angus x Hereford cows were fed to achieve either thin (BW=288 ± 8 kg; BCS=4.2 ± .2) or moderate (BW=493 ± 68 kg; BCS=5.2 ± .4) body condition. On d 0, blood serum was collected at 10 min intervals for 8 h from both moderate (n=4) and thin (n=4) cows. On d 1, moderate cows were randomly assigned to receive either a restricted diet (2.25 kg of prairie hay) or maintenance diet (9 kg of prairie hay and 1.4 kg of alfalfa pellets) daily for 6 days (d 1 through 6). Blood serum samples were collected for 8 h at 10 min intervals on d 3 and 6. Concentrations of LH and FSH were quantified in serum on d 0, 3 and 6. The effects of BCS on hormone concentrations were determined by analyses of variance. The effects of acute nutritional restriction on LH and FSH concentrations were determined by analyses of variance using hormone concentrations on d 0 as covariates.

Results and Discussion

Cows with moderate body condition had greater ($P<.05$) LH concentrations than thin cows (6.84 vs 3.56 ng/ml, respectively) on d 0. Furthermore, FSH concentrations on d 0 were greater ($P<.06$) for moderate cows (2.11 ng/ml) than thin cows (1.58 ng/ml) (Figure 1). Concentrations of LH in thin cows were only 52% of the concentrations in moderate condition cows, whereas FSH concentrations in thin cows were 75% of the concentration in moderate condition cows. Thus, nutritional deprivation may have a greater effect on LH than FSH secretion. The responses observed in these ovariectomized cows may be different than those of intact cows since the ovaries produce proteins, peptides and steroids that are inhibitory and stimulatory to LH and FSH secretion.

On d 3 and 6, LH and FSH concentrations were affected by a type x day interaction ($P<.05$). On d 3, maintenance cows and restricted cows had similar LH concentrations (4.99 vs 5.68 ng/ml, respectively). However, on d 6, LH concentrations were greater ($P<.05$) for maintenance cows (3.51 ng/ml) than restricted cows (2.36 ng/ml; Figure 2). These data would indicate that restriction for 3 d did not alter LH concentrations, but feed restriction for 6 d decreased LH concentrations.

FSH concentrations on d 3 were 1.17 ng/ml for maintenance cows and 1.48 ng/ml for restricted cows. Restricted cows had a greater ($P<.05$) concentration of FSH (3.54 ng/ml) than maintenance cows (2.48 ng/ml) on d 6 (Fig. 3). In contrast to LH, feed deprivation for 6 d increased FSH concentrations in ovariectomized cows.

In summary, long-term nutritional restriction (26 wk) decreased both LH and FSH concentrations in ovariectomized beef cows. Acute (6 d) restriction of nutrition decreased concentrations of LH and increased concentrations of FSH in the serum of beef cows. Further studies are required to determine if short-term feed restriction could be detrimental to reproductive performance of beef cows.

Literature Cited

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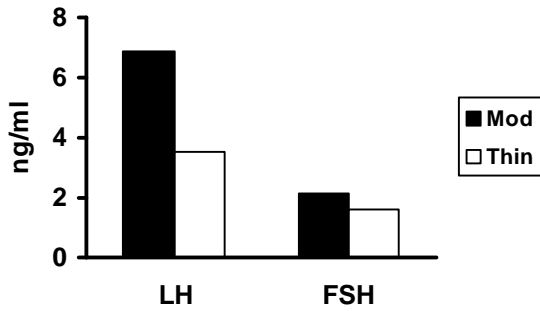


Figure 1. Concentrations of LH and FSH in moderate (Mod) and thin (Thin) cows on d 0.

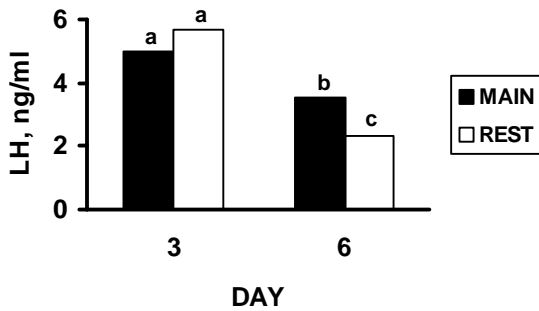


Figure 2. Concentrations of LH in cows fed maintenance (MAIN) or restricted (REST) diets.

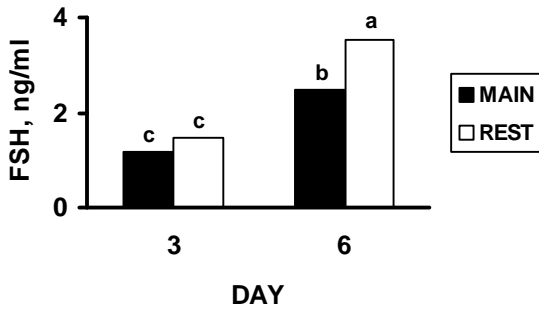


Figure 3. Concentrations of FSH in cows fed maintenance (MAIN) or restricted (REST) diets.