Summary and Abstract - Poster session
12th International Congress Animal Reproduction - HOLAND
pp - 2021 - 2026 - VOLUME 4 - 1992

Effects of body condition and GnRH pulse infusion on LH profiles, ovarian follicle populations and ovulation in postpartum beef cows

Luis P. Andrade, Stewart M. Rhind, Iain A. Wright, Stuart R. McMillen and Tom K. Whyte

Macaulay Land Use Research Institute, Pentlandfield, Roslin, Midlothian, EH25 9RF, Scotland.

It was postulated that low body condition in beef cows prolongs the postpartum anoestrous period as a result of a reduced LH pulse frequency. Groups of cows were fed pre-partum so that they achieved at parturition, and thereafter largely maintained, mean (± s.e.) body condition scores (BCS) of 2.07 ± 0.38 (low, L; n = 24) and 2.73 ± 0.27 (high, H; n = 12) measured on a 5 point scale. Half of the L cows were infused with 2 μg gonadotrophin-releasing hormone (GnRH) in 2 ml saline (G) every 2h for 14-18 d from week 5 postpartum while the remaining L cows and all H cows were infused only with 2 ml saline (S). During the infusion, the mean LH pulse frequency (pulses/h) was higher in G than S cows (0.32 v 0.23; s.e.d. = 0.031; P = 0.06) but it was not affected by BCS. At ovariectomy at week 7 postpartum mean (± s.e.) numbers of small (3-8 mm diameter) and large (> 8 mm diameter) ovarian follicles (25.5 ± 12.08 and 1.9 ± 0.93 respectively) were not affected by either BCS or GnRH infusion but a higher proportion of the LG cows ovulated compared with LS and HS cows (0.83 v 0.08; P < 0.001). It is concluded that LH pulse frequency is an important determinant of the duration of the postpartum anoestrous period.

EFFECTS OF BODY CONDITION AND GnRH PULSE INFUSION ON LH PROFILES, OVARIAN FOLLICLE POPULATIONS AND OVULATION IN POSTPARTUM BEEF COWS

L.P.Andrade, S.M.Rhind, I.A.Wright, S.R.McMillen and T.K.Whyte

Macaulay Land Use Research Institute
Pentlandfield, Roslin,
Midlothian EH25 9RF, Scotland

INTRODUCTION

Low body condition (LBC) at calving increases the duration of the postpartum anoestrous period in suckling beef cows. There is evidence that animals in LBC have a reduced incidence of LH pulses which is associated with a reduction in the incidence of large, oestrogenic, potentially ovulatory ovarian follicles.

An experiment was designed to determine: a) whether or not the normal process of follicular development can be accelerated in LBC cows by infusion of pulses of GnRH, so that their postpartum anoestrous period is as short as that of cows in high body condition (HBC) and b) the effect of GnRH pulse infusions on associated gonadotrophin profiles.

MATERIALS AND METHODS

Thirty-six suckling Blue-Grey cows (White Shorthorn x Galloway) with a mean (±s.e.) live weight of 506 + 6 kg and mean (±s.e.) condition score of 2.8±0.34 at 110 days before calving to a synchronized insemination were used. During the last 110 days of pregnancy cows were individually fed variable quantities of grass silage so that they achieved mean body condition scores of 2.07 ± 0.38 (Low; L; n=24) or 2.73 ± 0.27 (High; H; n=12) at calving. After calving, all cows were fed silage and concentrate in amounts which maintained live weight and condition (0.23 MJ metabolizable energy per kg live weight/day).

L cows were allocated randomly to 2 treatment groups and infused with either saline (LS) or GnRH (LG). The high body condition cows were infused only with saline (HS). Boluses of 2 µg GnRH were infused during periods of 1 min every 2 h for a period of 2 weeks from 5 weeks postpartum.

Blood samples were collected at 20 min intervals for 10 hours at weeks 4 (pre-infusion), 5 (days 6-7 of infusion), and 7 postpartum (days 13-14 of infusion) and were later assayed for LH (all samples) and FSH (every fourth sample). All cows were ovariectomized at week 7 postpartum and ovarian follicles dissected from the stroma and measured.

RESULTS

At ovariectomy, at week 7 postpartum mean, (±s.e.) numbers of small (3-8mm diameter) and large (≥ 8mm diameter) ovarian follicles (25.5 + 12.08 and 1.9 + 0.93 respectively) were not affected by either body condition (BC) or GnRH infusion.

TABLE 1

Mean circulating FSH and LH concentrations (ug/l) LH pulse frequencies (pulses/hour) and pulse amplitudes (ug/l) at 4, 5 and 7 weeks postpartum in cows in each treatment group

Weeks	4			5			7			s.e.
BCS/ Treatment	HS	LS	LG	HS	LS	LG	HS	LS	LG	
FSH	17.25	14.11	16.18	20.25	15.62	16.23	19.69	14.00	18.47	2.31
LH	1.32	0.963	0.944	1.663	1.310	0.672	1.091	1.367	1.422	0.174
LH pulse frequency	0.229	0.221	0.200	0.208	0.233	0.183	0.216	0.242	0.317	0.01
LH pulse amplitude	2.63	1.91	1.85	2.29	1.99	1.50	2.11	2.24	2.51	0.11

In the LS and HS groups, two cows had ovulated (1H and 1L) but in the GnRH infusion group (LG) 10 in 12 cows had ovulated, as indicated by the presence of corpora lutea at ovariectomy. In the LG group 2 of the 10 cows that had ovulated had a CL which was not fully functional as indicated by the fact that circulating levels of progesterone were < 1.5 µg/l during the week before ovariectomy.

Mean circulating concentrations of LH and FSH were not affected by BC or infusion of GnRH (Table 1). Concentrations remained relatively constant during weeks 5-7 postpartum in all groups.

There was no significant effect of either BC or GnRH infusion on LH pulse frequency or LH pulse amplitude but the LH pulse frequency was higher in the LG cows at week 7 compared with the LS and HS cows (0.317 v 0.229 pulses/hour; $p = 0.06$).

These results contrast with the previous observations which showed that cows in high levels of BC had higher LH pulse frequencies during the postpartum period and suggested that the effects of BC on the duration of the postpartum period could be mediated through this mechanism. While the effect of BC on LH pulse frequency appears to be equivocal, the increased incidence of ovulations in cows infused with GnRH suggests that LH pulsatility, nevertheless, may be an important determinant of the pattern of follicle development and of the duration of the postpartum anoestrous period.

In conclusion, the results of this study suggests that circulating FSH concentrations are not a limiting factor with regard to the onset of cyclic activity postpartum. LH pulsatility appears to have an important role in the determination of the interval between calving and ovulation in postpartum beef cows, but the effects of body condition on follicle development during the postpartum period do not seem to be mediated only through differences in LH pulse frequency.