

Effect of GnRH pulse infusion on LH profiles and ovarian follicle populations at 7 weeks post-partum in beef cows in different body conditions

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Introduction

Previous studies have indicated that low body condition (LBC) at calving increases the duration of the postpartum anoestrous period in suckling beef cows (Henricks *et al* 1986; Wright *et al* 1987). The results of recent experiments also suggest that animals in LBC have a reduced incidence of LH pulses (Wright *et al* 1990) which is associated with a reduction in the incidence of large, oestrogenic, potentially ovulatory ovarian follicles (Prado *et al* 1990).

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 was as short as that of cows in HBC and b) the effect of GnRH pulse infusions on associated gonadotrophin profiles.

Materials and Methods

Thirty-eight suckling Blue-grey cows with a mean ( $\pm$  se) live weight of  $506 \pm 6$  kg and mean ( $\pm$  se) body condition score (BCS) of  $2.8 \pm 0.3$  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 BCS of  $2.07 \pm 0.38$ , (Low; L; n = 24) or  $2.73 \pm 0.27$  (High; H; n = 12) at calving. They were fed to maintain BCS after calving. H cows were infused only with saline (HS). L cows were allocated randomly to two treatment groups and infused with either saline (LS) or GnRH (LG). Boluses of 2 $\mu$ g GnRH were infused over period of 1 min, every 2 hours, for 2 weeks from 5 weeks postpartum. Blood samples were collected at 20 min intervals for 10 hours at weeks 4 (pre-infusion), 5 (days 6-8 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 ovariectomised at week 7 postpartum and ovarian follicles dissected from the stroma and measured and counted.

Results

At 7 weeks after calving there was no effect of BCS or GnRH treatment on the mean numbers of small or large follicles in either size class (Table 1).

TABLE 1

Mean ( $\pm$  s.e.) numbers of small (3-7.9 mm diameter) and large ( $\geq$  8 mm diameter) follicles and corpora lutea (CL) at 7 weeks post partum in cows in each treatment group

BCS/Treatment n	HS 12	LS 11	LG 12	Significance of effect of	
				BCS	Treatment
No of small follicles	24.3 $\pm$ 14.0	27.2 $\pm$ 10.1	24.9 $\pm$ 13.5	NS	NS
No of large follicles	1.33 $\pm$ 0.71	2.27 $\pm$ 1.10	1.50 $\pm$ 1.00	NS	NS
No of cows with CL	1	1	10	NS	***

In the LS and HS groups, two cows had ovulated (1H and 1L) but in the GnRH-infusion group (LG) 10 of the 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  $>1.5\mu$ g/l during the week before ovariectomy.

Mean circulating concentrations of LH and FSH were not affected by body condition or infusion of GnRH (Table 2). Concentrations remained relatively constant during weeks 5-7 postpartum in all groups.

There was no significant effect of either BCS or GnRH infusion on LH pulse frequency or LH pulse amplitude but the LH pulse frequency was slightly 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 observations of Wright *et al* 1987 who found that cows in high levels of body condition had higher LH pulse frequencies during the postpartum period and suggested that the effects of body condition on the duration of the postpartum period could be mediated through this mechanism.

TABLE 2  
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

While the effect of body condition 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 suggest 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 the development of the follicles during the postpartum period do not seem to be mediated only through differences in LH pulse frequency.

#### References

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# "Effect of GnRH pulse infusion on LH profiles and ovarian follicle populations at 7 weeks post-partum in beef cows in different body condition"

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## 1 Aims

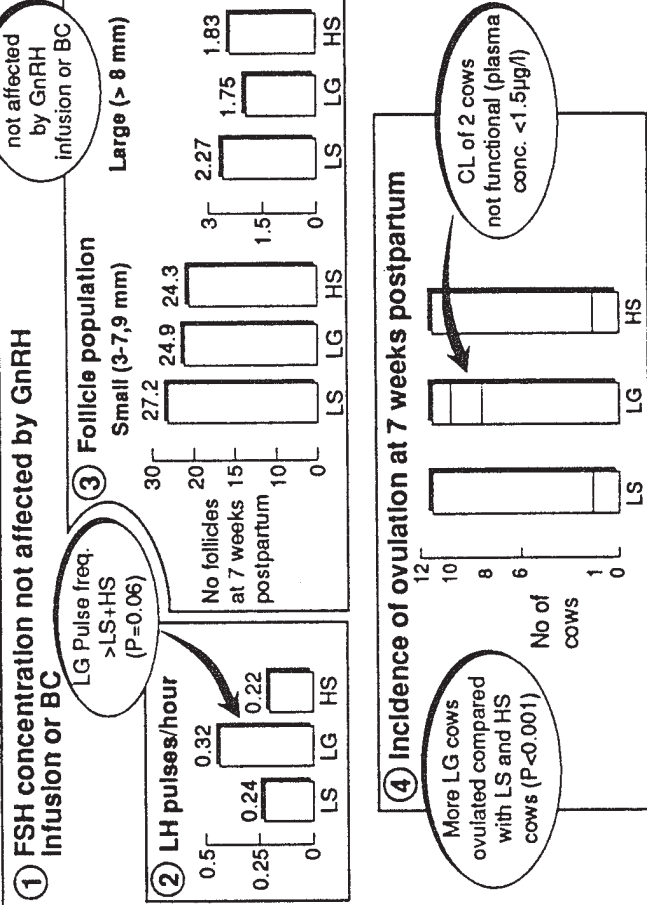
To determine the role of LH pulses in:

- the pattern of development of ovarian follicles
- control of the postpartum interval (i.e. - do additional pulses of LH make a thin cow physiologically similar to a fat cow?)

## 2 Methods

- 36 Blue grey cows fed to achieve different levels of body condition (BC) at calving:
  - Low (L) -  $2.07 \pm 0.38$ ; n=24
  - High (H) -  $2.73 \pm 0.27$ ; n=12
- Fed to maintain BC after calving.
- From 5 weeks postpartum cows were infused for 14-18 days with GnRH(G) or saline(S) as follows:
  - 12 cows(LG) - 2µg GnRH in 2ml saline every 2h.
  - 12 cows(LS) - 2ml saline every 2h.
  - 12 cows(HS) - 2ml saline every 2h.
- Blood samples collected via jugular catheters at 20min intervals for 10h at week 4 (pre-infusion), 5 and 7 (infusion) and gonadotrophin profiles characterized.
- Progesterone concentration determined in samples 3 times per / week
- At week 7 (postpartum) cows ovariectomized.
- Follicles > 8mm diameter dissected, measured, counted and incubated in medium 199 in order to determine production rates of oestradiol and testosterone.

## 3 Results



## 4 Conclusions

- FSH profiles are not a limiting factor with regard to the onset of cyclic activity postpartum.
- LH pulsatility has an important role in determining the time of ovulation in postpartum beef cows.
- Development of follicles (and functional CL) may depend on additional factors.