Sub-fertility in beef cattle: follicle dynamics and progesterone concentrations during the estrus cycle

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The repeat breeder syndrome has been characterised in dairy cows, but the experimental model used virgin heifers as controls[1], which may potentially be sub-fertile. The aim of this study was to characterize the pattern of follicle and corpus luteum (CL) development and progesterone concentrations during the estrus cycle in fertile and sub-fertile adult beef cows.

Eleven Hereford cows (fertile n = 5; sub-fertile n = 6) were used in this experiment. The categories were defined based on their pregnancy rate at two and five years old after five services at each age (three by artificial insemination [AI] and two by natural mating) in fertile (pregnant at first AI at two years old, pregnant ≥ 3 times at five years old) and sub-fertile (pregnant at the fourth of fifth service by natural mating or did not got pregnant at two years old and got pregnant one or two times at five years old). At seven years old, the health status of the reproductive tract was evaluated by ultrasonography and cows were synchronized with two intramuscular prostaglandin (PG, 0.075 mg Cloprostenol-D, Fatro® Laboratory, Uruguay) injections given 14 d apart. Signs of estrus behaviour observed every 12 hr. The ovarian scanning began on the day of the second PG injection and continued daily for a complete estrous cycle up to d 7 of the following cycle. The size of the CL and all follicles (≥ 2 mm diam.) were registered and drawn in maps to analyse the rate of growth and regression of dominant follicles and describe the follicular waves. Plasma samples were collected daily by jugular venepuncture to determinate progesterone concentrations by RIA. Data were analysed by ANOVA, using the GLM and MIXED procedures in SAS. Values were considered significant if $P < 0.05$.

There were no differences in body weight, body condition or height between fertile and sub-fertile cows. There were no differences between groups in the rate of growth and regression of dominant follicles, number of follicular waves, area of the CL, number of 2 to 5 mm follicles, total number of follicles, duration of the estrous cycle or interval from estrus to ovulation. However, progesterone concentrations were higher in sub-fertile (7.58 ± 0.96 ng/ml) than in fertile (5.19 ± 1.08 ng/ml; $P < 0.01$) cows from d 8 to 18 of the cycle.

In conclusion, under the conditions in which this experiment was conducted, sub-fertile cows had higher concentrations of progesterone than fertile cows. These findings could be associated with differences in liver metabolism and the opposite relationship between circulating progesterone concentrations and the expression of its receptors in the uterus[2] known to affect embryo survival.

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[1]Båge et al., 2002. Theriogenology 57:2257-2269.
[2]Sosa et al., 2004. Anim Reprod Sci 84:337–348.