

EFFECTS OF PROGESTERONE TREATMENT ON OVARIAN FUNCTION IN PREPUBERTAL HEIFERS

A. Garcia, A.P. Beard, A.C.O. Evans and N.C. Rawlings

Department of Veterinary Physiological Sciences, Western College of Veterinary Medicine,
University of Saskatchewan, Saskatoon, Saskatchewan, S7N 0W0, Canada

Prior to first ovulation, heifers exhibit a wave-like pattern of follicular growth similar to that seen in adult cyclic animals. In these heifers, prior to the establishment of regular estrous cycles, one or more 3 to 5 d periods of progesterone secretion are seen. Progesterone treatment prior to the first ovulation synchronises or induces ovulation. We wanted to see if exposing heifers to progesterone for 4 d during the growth of a dominant follicle shortly prior to first ovulation would alter follicular dynamics and result in early ovulation. Seventeen age-matched (± 10 days) spring-born heifers were examined daily by transrectal ultrasonography from 44 to 54 wks of age (mean first ovulation 56.5 ± 1.2 wks), the position and diameter of CL and follicles ≥ 3 mm diameter were recorded, and a blood sample was collected. Further blood samples were collected 3 times per wk until heifers had a luteal phase of 12 d or more in duration. Heifers in one group (OP; One-time progesterone treatment, $n=6$) were given a single 4 d exposure to a progesterone-releasing intravaginal implant (CIDR-B, Carter Holt Harvey Plastic Products, Hamilton, New Zealand). The CIDR-B was inserted the day after a dominant follicle of the first follicular wave observed reached ≥ 6 mm diameter. A control group ($n=6$) had blank (no progesterone) CIDR-B's inserted during the same period of follicular growth. Heifers in a third group (MP; Multiple times progesterone treatment, $n=5$) were exposed to 4 periods of progesterone treatment, with 1 untreated follicular wave separating each treatment. The CIDR-B treatments increased serum progesterone levels to 4.56 ± 0.16 ng/ml for 4 d, whereas progesterone concentrations in the control heifers remained below 0.25 ng/ml. Mean maximum diameter of the dominant follicle present during treatments did not differ between the OP, MP, and control groups (12.2 ± 0.1 , 12.9 ± 0.2 , 12.5 ± 0.2). However, the mean inter-wave interval was longer in treated vs control follicular waves ($P < 0.05$) in both the OP (9.4 ± 0.5 vs 7.7 ± 0.3) and MP (9.3 ± 0.3 vs 7.2 ± 0.3) heifers. The time taken for the dominant follicle to grow from 6 to 12 mm diameter was significantly extended in treated vs non-treated follicular waves ($P < 0.05$) in both the OP (7.4 ± 0.6 vs 5.0 ± 0.3) and MP (5.9 ± 0.5 vs 4.2 ± 0.3) groups. In 3 heifers (1 OP and 2 MP) progesterone treatment was followed immediately by ovulation of the dominant follicle and the subsequent oestrous cycle was of normal length (CL visible for 20 d, progesterone mean maximum 6.15 ± 1.1 ng/ml). One control heifer ovulated during the scanning period and subsequently had a short oestrous cycle (CL visible for 8 d, progesterone maximum 2.78 ng/ml). All other heifers ovulated after the end of the scanning period and first ovulation was followed by a short cycle in every case. In summary, progesterone treatment of heifers during the growing phase of a prepubertal follicular wave slowed the growth of the dominant follicle and delayed the emergence of the following follicular wave. Treatments were projected to start close to the expected time of first ovulation based on previous studies. However, most heifers ovulated late, after the scanning period. The lack of ovulation immediately after progesterone treatment was probably due to the administration of progesterone too far before expected pubertal ovulation. When ovulation occurred immediately after progesterone withdrawal, those follicles formed a CL with a lifespan similar to the estrous cycle in adult cattle, all other ovulations were followed by the formation of a CL with a short lifespan.