ABSTRACTS

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Canine luteal function in pregnant and nonpregnant bitches

Günzel-Apel, A1; Urhausen, C1; Einspanier, A2; Oie, C3 and Piechotta, M1

1University of Veterinary Medicine, Hannover, Germany, 2Faculty of Veterinary Medicine, University of Leipzig, Germany and 3Faculty of Veterinary Medicine, University of Utrecht, The Netherlands

anne-rose.guenzel-apel@tiho-hannover.de

OBJECTIVES AND METHODS: The canine ovarian cycle includes a spontaneous luteal phase with a length of about two months similar to that of pregnancy, which in relation to ovulation (ov.) takes on average 63 ± 1 days. As in both nonpregnant and pregnant bitches the corpora lutea are the only source of progesterone (P4), monitoring luteal function can be easily performed by determining the P4 blood serum concentration at regular intervals throughout the luteal phase. Nevertheless although similar in shape individual P4 patterns may vary considerably both in absolute P4 concentrations and the interval between ovulation and the first day of P4 <2 ng/ml, accepted as cut-off value regarding impending abortion or parturition (1). Pregnant cycles are characterized by enhanced P4 secretion effected by pregnancy-related increases in prolactin (PRL) after implantation, perhaps in response to increased relaxin (RLX) (1). In a previous study (2) we could show that in German Shepherd (GSD) bitches with an oestrus interval of <5 months and reduced fertility, P4 concentrations measured from day 5 to day 45 after ov. were significantly lower (P<0.05). Moreover in progressed luteal phase (from day 40 to 60 after ovulation) P4 values <2 ng/ml were observed earlier and at a higher percentage than in the control group with an oestrus cycle length of ≥6 months. Furthermore in the pregnant bitches with short oestrus cycles significantly lower concentrations of PRL and RLX were found between day 20 and 60 after ov. giving rise to a suspicion of secondary luteal deficiency due to reduced secretion of the luteotropic PRL and the underlying RLX. Comparison of blood serum concentrations of the three pregnancy related hormones (P4, PRL, RLX) in normocyclic pregnant GSD bitches and Beagles revealed significantly lower P4 values in GSD only in late luteal phase (day 50 to 60 after ov.) (P<0.05), whereas PRL was at a significantly (P<0.05) and RLX at a tendentially lower level in the GSD throughout pregnancy (3).

The incidence of hypoluteoidism in the population of breeding bitches is still unknown. Looking back to our previous study (2) it seems doubtful that intramuscular injections of 1-2 mg P4 in oily solution at 2 day intervals until day 50 to 55 after ov. would have been able to prevent abortion in case of luteal deficiency as in ovariohysterectomized Beagle bitches P4 has been shown to drop to <2 ng/ml within 48 hours after the last P4 injection (unpublished data). However, verification of hypoluteoidism in breeding bitches may be important for breeding soundness evaluation regarding exclusion of possible hereditary luteal dysfunction. Monitoring the ovarian P4 secretion in pregnant bitches is prevented as soon as exogenous P4 is administered for prevention of pregnancy loss, because both, the endogenous and exogenous P4 will contribute to the P4 concentration measured in blood serum (2,3,4). Thus the use of a synthetic progestin, which does not cross react with P4 at assaying may help to monitor luteal function in pregnant bitches suspected to be afflicted by hypoluteoidism. Daily oral administration of medroxyprogesterone acetate (MPA) at a dosage of 0.1 mg/kg body weight has been shown to prevent abortion in a 2.5-year-old Bernese Mountain dog with a history of two previous pregnancies ending in abortion around day 50 (5). Concomitant P2 analysis revealed hypoluteoidism indicated by a premature P4 decrease to <2 ng/ml between day 42 and 47 after mating. According to this case report and to the own observation, that MPA treatment did not affect the secretion of either P4 or PRL in normocyclic nonpregnant Beagle bitches (3), we chose this treatment to verify luteal function in selected cases of suspected hypoluteoidism in a preliminary clinical study. A total of five breeding bitches: Bernese Mountain dog- case 1, Beagle - case 2, GSD I - case 3, GSD II - cases 4a and 4b, Rottweiler - case 5) suspected to be afflicted by hypoluteoidism according to different histories (cases 1 and 2: short oestrus cycle of 4 months and short nonpregnant luteal phase; case 3: reduction of cycle length from 5.5 to 4 months; cases 4a, 4b and 5: previous pregnancy failure) were treated with MPA tablets at a dosage of 0.1 mg/kg body weight once daily (4), starting the earliest on day 30 after ov., at the onset of the fetal phase of pregnancy. Treatment was finished according to P4 concentrations monitored during treatment at 1 to 8 days intervals until parturition or c-section. Blood serum samples were additionally analysed for concentrations of PRL and RLX as previously describend (2,3).

RESULTS: From the five dogs only the Rottweiler bitch with a history of suspected previous pregnancy failure showed clear signs of hypoluteoidism according to premature drop of P4 concentrations to <2ng/ml (day 51: P4 1.4 ng/ml). In the other five cases P4 concentrations <2 ng/ml were detected on day 58 (case 4b), day 60 (case 1), and later than day 60 after ov. (cases 2, 3, and 4a). In three cases, in which MPA treatment was stopped on day 52 (case 2), day 56 (case 3) or day 57 after ov. (case 4b) pregnancy resulted in spontaneous parturition 8 days (cases 2 and 3), and 1 day (case 4b) late. In the other three cases with MPA treatment ending on day 57 (cases 1 and 4a) or day 58 after ov. (case 5) c-section had to be performed because of missing signs of parturition and decreasing fetal heart rates. Intervals between the last day of treatment and c-section were 5 days. In case 1, four vital puppies, in case 4a, one vital and two dead puppies were
delivered. In case 5, c-section was performed 6 days after MPA withdrawal and by this one day later than recommended, resulting in the delivery of three vital puppies, four stillbirths and two puppies dying shortly after birth. Between day 30 and 60 highest blood serum concentrations of both PRL and RLX were found in the beagle bitch (case 2: PRL 8.0-52.4 ng/ml, RLX: 1.5-3.8 ng/ml). In the other bitches hormone values showed the following ranges: case 1 - PRL 7.2-13.3 ng/ml; RLX 1.9-2.3 ng/ml; case 3 - PRL 3.7-6.3 ng/ml, RLX 0.9-2.0 ng/ml; case 4a - PRL 4.9-9.5 ng/ml, RLX 0.6-0.9 ng/ml; case 4b - PRL 5.3-21.9 ng/ml, RLX 1.0-1.3 ng/ml; case 6 - PRL 3.3-8.2 ng/ml, RLX 0.3-0.9 ng/ml.

CONCLUSION: A relatively short cyclic luteal phase may contribute to a shortening of the oestrus cycle length but may not represent the competence of luteal function regarding maintenance of pregnancy (cases 1, 2, 3). Low P₄ concentrations together with low levels of both PRL and RLX found in the only bitch afflicted by hypoluteoidism (case 5), may indicate a potential deficiency in luteotropic support. In case 4a (GSD with a history of fetal death in two previous pregnancies), P₄ concentrations indicated normal luteal function to term as after discontinuation of MPA treatment on day 57 pregnancy was maintained for further five days. In the next pregnancy of this bitch (case 4b) parturition took place on day 58 and by this only 24 h after MPA treatment was finished at a P₄ concentration of 0.9 ng/ml indicating differences in luteal function between pregnancies in this individual bitch. Nevertheless both PRL and RLX were at a considerably lower level in the first (case 4a) than in the second pregnancy (case 4b), indicating no direct relation between these two hormones on one side and P₄ secretion on the other side. Despite the small number of cases included in this preliminary clinical study so far the results indicate that the incidence of hypoluteoidism may be low in bitches with corresponding histories. Nevertheless verification of this presumption needs further studies based on a higher number of cases and a more consistent experimental design.