Daily progesterone fluctuations during the estrous cycle in the bitch.

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The use of progesterone assays to determine the optimal time during estrus for mating or artificial insemination (AI), and during late pregnancy for a planned Cesarean section, have become routine procedures. Both quantitative and qualitative assays are being used, and the results may vary considerably depending on the reliability of the assay, and also with the individual bitch. The aim of the present study was to define the daily physiological variation in progesterone in bitches during the non-pregnant and pregnant estrous cycle using an immunoassay (Amerlite) validated for the dog, with an intra-assay coefficient of variation (CV) of <4%, an inter-assay CV of <8.1% and a detection limit of 0.20±0.06nmol/L(1).

Six bitches, 2 to 8 years old, were used. Four bitches were followed during a non-pregnant cycle, and 2 during a pregnant cycle. Blood samples were collected from the cephalic vein three times daily, at 8.00-9.30, 13.00-14.00 and 15.00-16.00 in heparinized tubes that were centrifuged and the plasma stored frozen until analyzed. During proestrus and estrus the bitches were sampled three times per week and during metestrus once a week.

Mean progesterone levels per week and the CVs are show in Table 1. Progesterone variations in one of the non-pregnant cycles are shown in Figure 1, and in one of the pregnant cycles in Figure 2. The large variation in progesterone between the three sampling times each day found in this study is of a considerable clinical importance. In three of the individual bitches the difference in progesterone in one day during the optimal period for mating or AI was as large as 7.9 nmol/L (20.4 – 28.3 nmol/L), 8.3 nmol/L (23.6 – 31.9 nmol/L) and 12.7 nmol/L (36.7 – 49.4 nmol/L). During metestrus the daily individual variation was up to 49.1 nmol/L (77.1-126.2 nmol/L). No diurnal variations were found using this 3 times daily sampling regimen, which is in contrast to some earlier studies using a twice daily sampling model (2,3).

Table 1. Progesterone values (means) and coefficients of variation (CV) in pregnant and non-pregnant bitches during the different weeks of the estrous cycle.

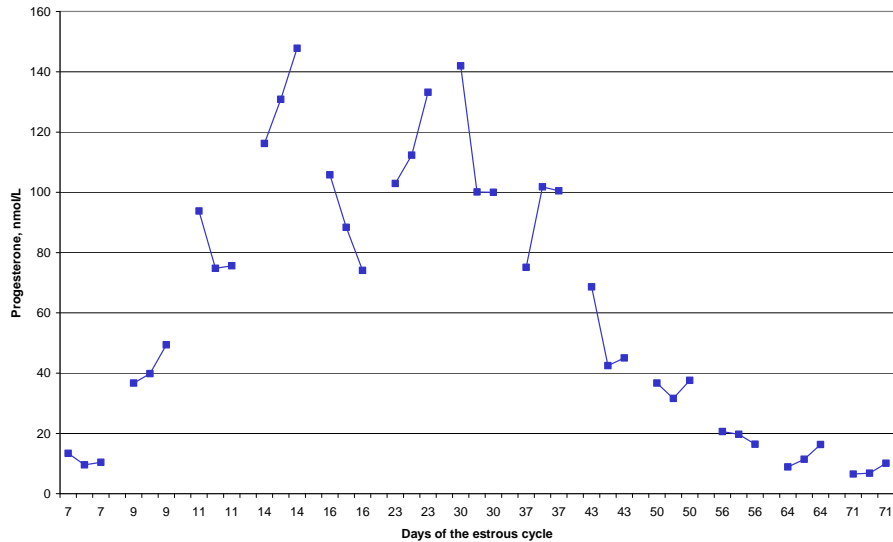| Week of the estrous cycle	Progesterone non-pregnant (nmol/L)	CV non-pregnant (%)	Progesterone pregnant (nmol/L)	CV pregnant (%)
1	5.4	39.8	*	*
2	53.8	23.7	64.5	*
3	100.2	26.0	90.3	16.0
4	109.3	28.1	82.4	21.0
5	99.7	18.1	76.7	12.0
6	79.4	30.9	60.2	17.0
7	37.3	27.5	39.8	18.0
8	19.8	26.5	25.4	6.7
9	8.6	43.7	12.3	21.0
10	5.2	59.8	18.1	19.0
11	3.4	62.8	*	*

* = not done

Figure 1. Variations in progesterone in the three daily samples in one of the non-pregnant cycles.
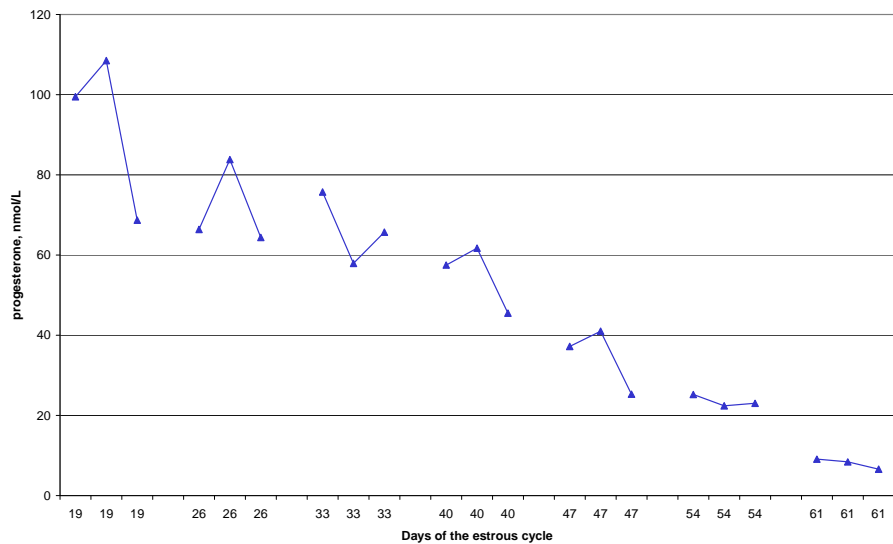

Figure 2. Variations in progesterone in the three daily samples in one of the pregnant cycles.

Also when using a well validated assay for progesterone in the dog, with a high sensitivity, accuracy and precision, large fluctuations in progesterone over the day were discovered depending on a rhythmic secretion of this hormone. Further studies should be performed to determine whether a diurnal pattern of secretion of progesterone occurs in the dog.

References:
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2.Steinetz B, Goldsmith L, Syed H et al. Diurnal variation of serum progesterone, but not relaxin, prolactin, or estradiol-17β in the pregnant bitch. Endocrinology 1990; 127:1057-63.
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