ABSTRACTS

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FOLLICULAR DYNAMICS, OVULATION AND CONCEPTION RATE IN BITCHES

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Introduction - There is poor understanding of follicle dynamics throughout anoestrus and oestrus in the bitch, and no data on ovulation or conception rates. The purpose of this study, using real-time B-mode ultrasound, was to; (1) quantify changes in follicle size and number during anoestrus, (2) document follicular dynamics and ovulation during oestrus, (3) establish the percentage of follicles that ovulate, and (4) assess conception rates in bitches mated to fertile stud dogs.

Materials and methods - Ovaries and uterus were examined using a 10 MHz transducer. As appropriate the number of follicles or corpora lutea (CLs) within each ovary or conceptuses within the uterus were recorded. Follicles were recorded as either small (1-3mm) or large (>4mm). The day of the LH surge (day zero) was considered to be when plasma progesterone exceeded 2.5ng/ml. Male dogs used for mating had normal fertility (>300 million normal motile sperm) assessed by semen evaluation.

Study 1: Follicle size and number throughout anoestrus, oestrus and early pregnancy. Eight Labrador bitches were examined as part of their routine breeding management. a. Ovaries were examined at 10-day intervals from 60 days after oestrus until the onset of the proestrus. b. Thereafter, each was examined daily. Plasma progesterone was measured every 2 days using an ELISA method. Each bitch was mated twice between day +4 and +7. The number of conceptuses at day +25 and the number of pups born was recorded.

Study 2: Follicle and CL size number and gross examination of the ovaries. Six cross-bred bitches that were planned to be neutered were examined on 2 occasions; (i) during standing oestrus and (ii) on the day of surgical neutering performed in week 3 after the end of behavioural oestrus. Due to the variation in the examination times only the total number of structures was recorded rather than their differential size. Ovaries were collected following routine ovariohysterectomy. The size/number of ovarian structures were assessed grossly and confirmed by histology.

Study 3: Ovulation and conception rates. Ninety-seven Labrador and Labrador /golden retriever bitches aged between 1.7 and 4.2 years were subject to the same breeding management regime as Study 1. The ovaries were examined and total number of structures recorded on 2 occasions; (i) immediately prior to ovulation (between day -2 and +1) and (ii) post ovulation (between day +10 and +15) and structures were recorded as in Study 2. The number of conceptuses was recorded at day +25 and the number of pups born was noted.

Descriptive statistics and assessment of Spearman’s correlation and linear regression was performed using Instat for Macintosh (GraphPad Inc.). Values were considered to be significant when P<0.05.

Results
Study 1: Follicle size and number throughout anoestrus, oestrus and early pregnancy. a. Follicles were absent at the first examinations but scant numbers of small follicles were identified from approximately day -100 onwards. From approximately day -60 there was a
dramatic increase in the number of small follicles within each ovary to \(2.2 \pm 1.1\) (mean \(\pm\) SD) follicles/ovary. There was a decline in the number of small follicles immediately prior to the onset of proestrus (approximately day -20).

b. There was then a large increase in the number of small follicles peaking at a \(7.6 \pm 1.2\) small follicles/ovary on day -5. Thereafter the number of small follicles gradually declined. The number of large follicles increased from day -4 and peaked at a maximum number \((4.8 \pm 1.2\) large follicles/ovary) on day -1. The number of large follicles was then consistent until day +1. There was a dramatic decline in the number of large follicles between day +1 and +2, and a concomitant increase in the number of CLs. \(6.75 \pm 2.1\) conceptuses were identified and \(6.5 \pm 2.1\) pups were born (2 bitches each whelped 1 pup fewer than the number of conceptuses identified).

Study 2: Follicle and CL size number and gross examination of the ovaries.
For all bitches the number of CLs identified with ultrasound was the same as the number of follicles that had previously been observed. Furthermore, there were no differences between the number of CLs identified with ultrasound and the number of CLs observed during inspection of the ovaries after removal.

Study 3: Ovulation and conception rates.
There was no significant difference between the mean number of follicles within the left or right ovaries. Fewer CLs \((5.3 \pm 1.4)\) were identified than follicles \((5.4 \pm 1.4)\) such that the mean ovulation rate was \(97.0 \pm 4.8\) %. 84 of the 97 bitches become pregnant \((86\%)\). For the bitches that were pregnant the conception rate on day +25 was a \(71.8 \pm 8.9\). At this time \(6.8 \pm 3.7\) conceptuses were identified, which was not significantly different to the number of pups born, although in 10 bitches fewer pups were born than the number of conceptuses identified; suggesting fetal resorption. There was a significant and linear correlation between bitch age and the number of follicles, number of corpora lutea and the percentage of follicles ovulating, but no relationship between the number of conceptuses, conception rate or number of pups born. There was a significant and linear correlation between the number of CLs and the number of conceptuses and number of pups born, but not the conception rate. The number of conceptuses was significantly and linearly correlated with the number pups born, but not the percentage of resorptions.

Discussion - This is the first study to demonstrate presumed follicle recruitment commencing between 100 and 60 days before the preovulatory LH surge. These observations are chronologically similar to the increase in basal plasma FSH and AUC for FSH\(^{(1)}\) and suggest a synchronicity of increased FSH and ovarian folliculogenesis. Furthermore, they are consistent with follicle selection and the emergence of a number of follicles to dominance immediately prior to the onset of proestrus. Interestingly, even within the limited range of ages studied, younger bitches had fewer ovulations, a lower percentage ovulation rate and fewer CLs than older bitches. Not surprisingly, the number of ovulations was related to the number of conceptions and pups born. This is the first study to report the percentage of ovulations that are fertilised and persist until day +25 (71.8\%).

References