

Ovulation Timing in the Dog  
Angela Hughes DVM  
UC DAVIS VMTH Genetics Resident

Left to their own devices, most dogs would breed at an appropriate time for conception. However, with human intervention in the form of limited schedules and/or compromised semen (chilled, frozen, or subfertile male), or if the dogs' behavior and cycle do not match, ovulation timing is critical to enhance conception. The female's eggs (ova) are only viable for fertilization in the uterus for 2-3 days during the entire heat cycle, which generally lasts three weeks or longer. Thus, improper timing for breeding is not an uncommon cause for conception failure.

There are various ways to monitor the hormones in a cycling bitch including vaginal cytology, vaginoscopy, progesterone levels, and luteinizing hormone (LH) levels. With each of these methods, proper interpretation of the results is key to properly time insemination. It is also important to combine some or all of the monitoring tools available to achieve the most accurate assessment of ovulation timing.

**Vaginal cytology:** Your veterinarian can use cotton tipped applicator to gently remove a few cells from the dog's vaginal vault and transfer them to a glass slide. The cells are then stained and examined under a microscope for a structural change. As the estrogen levels rise in the female, the vaginal walls thicken, producing "cornification" (flatter cells with sharper edges) as the vagina prepares for copulation. Alternatively, when estrogen levels are low, the cells are much rounder in appearance. This is a relatively easy and inexpensive test to determine the influence of estrogen; however, this does not necessarily correlate with the fertile period which is triggered later by a surge of the luteinizing hormone (LH). Thus, many breeders and practitioners use vaginal cytology every other day until approximately 70% of the vaginal cells are cornified and then they will begin using a direct hormonal assay to determine the exact fertile period.

**Progesterone levels:** Your veterinarian can obtain a small blood sample from the bitch every 1-2 days as she is nearing ovulation and have it tested for progesterone concentration by a qualified commercial laboratory. The first rise of progesterone above 2 ng/ml correlates with the day of the LH surge. Subsequently, ovulation occurs 24-48 hours after the LH surge and an additional 1-3 days are required for the eggs to mature in the uterus prior to fertilization. Thus, a bitch should begin breeding 2-4 days after the progesterone rises over 2 ng/ml. There are some reports that a serum progesterone concentration of 4-10 ng/ml occurs in association with ovulation however, this relationship is not well established and there is considerable variation in serum progesterone concentrations after the initial rise.

**LH levels:** It is also possible for your veterinarian to directly measure the LH concentration using a small blood sample. However, the LH surge can occur over a short period of time (12-24 hours) and may be very easy to miss. LH levels are measured daily using an in-house test and requires concurrent progesterone testing.

**Vaginoscopy:** A small scope can be used to visualize the vaginal vault. As the estrus cycle progresses, the hormones released affect the character of the vaginal mucosa. The mucosal surface becomes very wrinkled or "crenulated" as the bitch goes into estrous. The maximum amount of crenulation is observed during the fertile period 4-7 days after the LH surge. Due to individual variation, vaginoscopy can provide useful information, but should be used in conjunction with hormonal testing and vaginal cytology.

**Other Non-reliable Methods:** It is possible to find reference to many other methods of ovulation timing that have been used over the previous decades. Unfortunately many of these methods are unreliable and inappropriate for the domestic dog. For example, the Draminski Method evaluating electrical conduction in the vaginal canal was originally developed to assist researchers working with foxes however, the electrical conduction in the vaginal canal reflects estrogen levels and does not indicate ovulation or the fertile window. The glucose content in vaginal secretions has also been evaluated and was shown to be an unreliable indicator of ovulation and the fertile window.

The 'BEST' ovulation timing combines vaginal cytology, vaginoscopy, serum progesterone concentrations, and sometimes serum LH testing. This should be completed by your veterinarian. Recently, precise ovarian ultrasound techniques can be used to visualize ovulation. They require up to 3 examinations daily during the period of ovulation.