

# Week 2 Segment 1

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## WEEK 2: BREEDING MANAGEMENT / PREGNANCY AND WHELPING

Course notes for each segment may be read ahead of time or may be read after watching the video lecture for that segment. Students are strongly encouraged not to work through the quiz until after watching the video lecture and reading the course notes. Highlighted words are in the glossary. The URL is a link to course notes provided on the instructor's website for veterinary students and veterinarians throughout the world. The notes on this website may contain more material or alternative images.

### **Segment 1 – Notes:** Breeding management

([http://www.tc.umn.edu/~rootk001/Class\\_notes\\_Root\\_Kustritz.htm#breeding\\_management](http://www.tc.umn.edu/~rootk001/Class_notes_Root_Kustritz.htm#breeding_management))

In this segment, we will discuss purposeful breeding of dogs. I understand that some students are uncomfortable with the idea of purposefully breeding dogs when so many dogs are **ethanized** every year because of overpopulation and when there are large stray dog populations in some parts of the world. There is no question that some people breed dogs to raise money with little regard for the animals' welfare and that some people have bred for characteristics in some breeds that are not associated with good health. It is also true that many, many people work very hard to improve the health of dogs by selective breeding and are ethical breeders. Before any dog is bred, I strongly encourage the person responsible for that dog to determine what **hereditary** diseases exist in that breed and to test the dog for those conditions, and to have the dog's general health verified by a veterinarian. This should include a complete physical examination, and testing for **brucellosis**, an infectious reproductive tract disease of dogs. Only healthy dogs that are superior representatives of their breed should be used.

Dogs reproduced for centuries without human assistance. **Natural service**, where the male breeds the female multiple times over her standing heat, is associated with a higher conception rate than any assisted form of breeding. Natural service in dogs involves the male mounting the female and introducing his penis before it is fully erect. This is possible because all male dogs have a bone in their penis, the **os penis**. The male thrusts vigorously and it is during this stage that the male deposits semen. As the dog's penis becomes fully erect, the area nearest his body, called the **bulbus glandis**, becomes very large and gets caught within the vulva of the bitch. This is called the **copulatory lock**, or **tie**. While they are tied, the male will step over the female's back and they will stand, connected, facing away from each other, for anywhere from 5 to 60 minutes. During this stage, the male ejaculates waves of fluid from his prostate that help move the sperm forward in the bitch's reproductive tract, toward the uterine tubes where the eggs are. The tie is not required for bitches to become pregnant and length of the tie is not associated with increase in fertility or litter size. Many people find their bitch being bred accidentally during the tie; at this point, the semen has been introduced so there is no point in trying to get the dogs apart and it may, in fact, cause harm.

Sometimes natural service cannot occur. This may be because of behavioral incompatibility of the two dogs, physical problems with one or both dogs, or because a more advanced breeding technique is being used, such as **artificial insemination**. If assistance is required, breeding management requires determination of when ovulation occurs in the bitch.

Remember from the first session that the ovaries contain eggs and that those eggs are within [follicles](#). With every proestrus, a group of follicles begins to develop and secrete estrogen, causing the signs of heat we discussed last time. This growth of the follicles is due to secretion of a hormone called [follicle stimulating hormone](#) from the [pituitary](#) gland in the brain. Once the follicle is fully mature, release of [luteinizing hormone](#) (LH) from the pituitary stimulates ovulation, or release of the eggs from the follicles. Over about a 24-hour span, all of the follicles physically rupture open and the eggs are forcefully expelled. They are caught by the fingerlike-projections of the uterine tube and stay in the uterine tube (also called the fallopian tube or oviduct) as they finish their maturation. In dogs, although the eggs remain viable for at least six days after ovulation, they cannot be fertilized until about 48 hours after ovulation. After fertilization, the developing embryo moves into the uterus. Implantation of that conceptus to permit development of the placenta occurs 17 days after ovulation.

Vaginal cytology and measurement of progesterone in blood are the tools used to guide prospective determination of day of ovulation in most bitches. Other techniques exist but are beyond the scope of this course; interested students can read about them in [The Dog Breeder's Guide to Successful Breeding and Health Management](#) (pp 135-141).

Vaginal cytology cannot be used to definitively determine ovulation date and is used instead to guide the veterinarian regarding when to start drawing blood for measurement of progesterone. Most bitches ovulate when they've been in estrus for about two days. Most veterinarians will follow vaginal cytology from fairly early in the dog's heat cycle, and will draw blood for progesterone once vaginal cytology shows greater than about 75% cornification.

Serum progesterone rises in a predictable way prior to ovulation. The following scheme works in most bitches.

SERUM PROGESTERONE CONCENTRATION (ng/mL)	EVENT OCCURRING
Less than 1.0	Early in proestrus, cannot predict ahead to ovulation day
1.0 - 1.9	May be within three days of ovulation, must recheck
2.0 - 2.9	Often is indicative of a rise in luteinizing hormone (LH), which stimulates ovulation in two days, must recheck
3.0 - 3.9	May be within one day of ovulation, must recheck
4.0 - 10.0	This range indicates ovulation is occurring. Optimal breeding day for natural breeding or use of fresh or chilled semen is two days after ovulation.
Greater than 10.0 with cornified vaginal cytology	Remember that bitches go into diestrus six days after ovulation, signified by an abrupt return to non-cornified vaginal cytology. This bitch has ovulated and is still in estrus, and may be at optimal breeding day. Rise in progesterone after ovulation is variable.
Greater than 10.0 with non-cornified vaginal cytology	The bitch is in diestrus and it is too late to breed her on this heat cycle.

Timing of breeding varies with type of breeding. For natural service, the spermatozoa are healthy and may live in the

bitch's reproductive tract for at least seven days after breeding occurs. Eggs are viable for at least up to six days after ovulation. Bitches may become pregnant from single breedings from up to three days before to up to four days after ovulation. Much research suggests that if only one breeding is possible, optimal breeding day is two days after ovulation. This yields best conception rate and litter size. Research also documents that two or more breedings are superior to a single breeding.

To summarize, the best way to prospectively predict ovulation date is to follow concentrations of progesterone in blood. One way to retrospectively determine ovulation date is to perform vaginal cytology until the bitch goes into diestrus; it is six days from ovulation until onset of diestrus and the associated abrupt change from cornified to non-cornified cytology. Finally, pregnancy length in dogs is 63 days from ovulation so another retrospective method for determination of ovulation day is to count back 63 calendar days from whelping (giving birth).