

Hormone levels in a brood bitch

It is important to understand the role hormones play in the reproductive cycle of a brood bitch to be able to understand when to breed and when the bitch is ready to whelp. Here is a graphical demonstration of how the different hormones interact during the reproductive cycle of a brood bitch.

Oestrogen is the hormone that stimulates the ovaries to produce eggs, it also has effects on the bitch that make her exhibit the signs of oestrus or being in heat.

FSH or Follicle Stimulating Hormone is the hormone that tells the follicles or eggs contained within the ovaries to get ready to be released or ovulated.

LH or Leuteinising Hormone is the hormone that rises very quickly for a short period of time and tells the ovaries to release the eggs or it induces ovulation

Progesterone is the hormone that is essential to maintain the pregnancy, it is largely produced from the ovary once ovulation has occurred.

Prolactin is the hormone that stimulates the production of milk. It also has an effect of suppressing FSH. So if a bitch is lactating she will not come back into season due to the effects of prolactin.

There is also another hormone called **Relaxin** which causes the ligaments and cervix to relax to enable whelping to occur. It is also the hormone tested for after 28 days of pregnancy in the blood pregnancy tests for dogs.

There are pictures of cells at the top of the graph, these are diagrams to depict what the cells of the vaginal wall look like under a microscope during different stages of the cycle. This is what your vet is looking at when they do a smear to try and predict when to mate a bitch. I find these reasonably inaccurate for a number of reasons. Basically as the season progresses I describe the changes in the vaginal cells from going like grapes or rice bubbles to flat or like corn flakes. Then once the season finishes or it is too late to mate the cells start to appear like they did at the beginning of the season. They can give valuable information but should never be relied upon solely to get optimum results.

The most accurate way to determine ovulation and then the best time to breed the bitch is by doing serial progesterone testing. The progesterone level early in a season is usually between 1-4 nanomoles/litre (nmol/L). When the LH hormone has its peak, this corresponds with the initial rise in progesterone, the level of progesterone at this time is usually between 6-9 nmol/L. When ovulation occurs the progesterone level is usually between 15 – 25nmol/L. There will be some exceptions to this but to keep it simple this is

the case in the vast majority of bitches. Once ovulation occurs the progesterone levels should continue to rise, depending on the bitch, but they may finish up anywhere between 50-300nmol/L. Therefore if a bitch has been mated and after mating her levels fail to go above 50nmol/L, this would indicate that she has not ovulated properly and is unlikely to get in pup. Therefore it is important to continue testing the progesterone levels until the level has risen to indicate that she has ovulated.

So now that you understand the basics of progesterone levels and testing how does this tell you when to mate your bitch? Well this depends on your preferred method of breeding and whether you are using fresh, chilled or frozen semen.

For matings using fresh semen there is a greater window of fertility for mating. This is because the sperm will stay alive for a long time in the bitch. Generally it is accepted that sperm will stay alive for 3-5 days but possibly even longer. Sperm once ejaculated need to go through a process called capacitation that allows it to be able to penetrate the egg for fertilisation to occur. So with a natural mating once the sperm is deposited into the reproductive tract, allowing for time for capacitation and the time to travel to the oviduct it may be safe to assume that this may take up to 12 hours before the sperm are actually able to fertilise the egg. Also it takes the eggs up to 48 hours to be able to accept the sperm before fertilisation takes place. Therefore I think to have the best success with fresh semen it is important to start breeding around the time ovulation starts and then repeat the breeding 36-48 hours later depending on how much the progesterone levels are rising. Practically this means we start breeding 2-3 days after the initial rise in progesterone.

For chilled and frozen semen it is better to be doing the breeding later as the sperm does not stay alive as long and you do not want to be wasting the semen if the bitch does not ovulate properly. Generally with chilled and frozen semen a single breeding is done and this is once you know the bitch has ovulated. This means that we may be breeding between 3-6 days after the initial rise in progesterone as long as the progesterone levels continue to rise.

Progesterone levels are also very important in determining when the bitch is going to whelp. Pregnancy or gestation period is generally 63 days (+/- 1 day). I have found it to be more accurate to also factor in the figure of 67 days (+/- 1) from the initial progesterone rise that occurred as a result of the LH peak. The reason for the second date is that bitches whose progesterone levels rise very quickly at the time of mating tend to have longer gestation times. This also is backed up because their progesterone levels do not drop at the normal time which determines when the bitch will whelp. It also gives an indication for the importance of serial progesterone testing to determine the best time to breed as this additional information can help determine if the bitch is doing something abnormal when it comes time to whelp.

Traditionally people monitor the bitches temperature to determine when they will whelp. The only issue I have with this is that during the last week of gestation the temperature levels rise and fall all the time so I do not think a temperature drop is significant unless the temperature drops below 37C. The temperature drop is related to the drop in progesterone level. The progesterone level generally needs to drop below 6nmol/L before whelping is going to occur. Also sometimes it will take 24-36 hours from this progesterone drop before the bitch will start whelping.

I do not like to do an elective caesarian unless the progesterone levels have dropped. The reason is that when puppies are removed before the progesterone levels drop I have seen a very high incidence of mismothering. That is the bitches do not accept or will even attack their puppies, they also often fail to produce enough milk. I do not believe a caesarian contributes to mismothering in the vast majority of cases, just mis-timed caesarians. There is also the increased risk of prematurely separating the placentas and causing excessive bleeding after the caesarian if the puppies are not ready to be born.

There are exceptions to this rule but these are beyond the scope of this information. When I do make a decision to do a caesarian when the progesterone has not dropped it will be when I have all the information about progesterone levels prior to mating and also consider results of ultrasounds and the number of puppies in the litter. Sometimes when there is only one puppy the progesterone level will not drop all the way but still the majority will.

So to summarise,

- Serial progesterone testing is the most valuable tool when breeding your bitch. It not only helps determine most accurately the best time to breed, it also most accurately determines when the bitch is due to whelp. This is very important in giving your puppies the best chance of survival.

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