PROGESTERONE TESTING

What do the numbers actually mean?

A practical guide to ovulation timing, whelping dates, pregnancy support and progesterone-related uterine disease

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Progesterone testing is often reduced to a hunt for one 'magic' number. In reality, the most useful information is not the isolated result but the direction, speed and timing of the rise. Read properly, a progesterone graph can tell us when ovulation most likely occurred, help us choose the fertile window for the semen being used, and give us a far more reliable expected whelping date.

The short version: A number is a snapshot. A series of results is the story.

Why dogs are different

In most mammals, progesterone rises after ovulation. Dogs are unusual: the cells around the ovarian follicles begin to luteinise and produce progesterone before the eggs are released. That means a rising blood progesterone concentration gives us a practical indirect marker of the hormonal events surrounding ovulation.

The control pathway is properly called the hypothalamic–pituitary–ovarian (HPO) axis, also described more broadly as the hypothalamic–pituitary–gonadal axis.

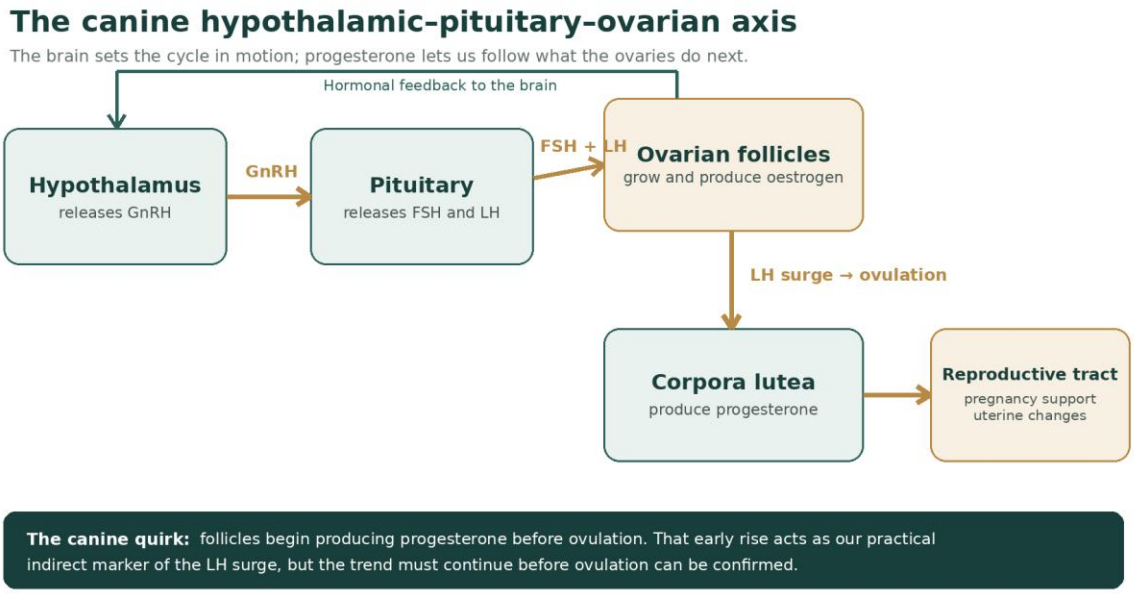

Figure 1. The HPO axis and the canine pre-ovulatory progesterone rise.

The hypothalamus releases gonadotrophin-releasing hormone (GnRH), which prompts the pituitary gland to release follicle-stimulating hormone (FSH) and luteinising hormone (LH). FSH supports follicular development. The short LH surge triggers the final sequence leading to ovulation and conversion of the emptied follicles into corpora lutea. Those corpora lutea then become the bitch's source of progesterone throughout pregnancy.

Direct LH testing would be the cleanest way to identify the biological 'day zero', but routine canine LH testing is not practically available to us in New Zealand. We therefore use serial progesterone measurements, usually alongside examination, vaginal cytology and sometimes ultrasound, to reconstruct that timeline.

So, what do the numbers mean?

New Zealand laboratories and in-clinic analysers commonly report progesterone in ng/mL; some laboratories and overseas information use nmol/L. The conversion is 1 ng/mL = 3.18 nmol/L. The ranges below are deliberately broad because different analysers can give meaningfully different results on the same sample.

Progesterone	Approx. nmol/L	Likely stage	What it means in practice
Below ~1 ng/mL	Below ~3 nmol/L	**Usually baseline**	No clear pre-ovulatory rise yet. Retesting is normally required.
~1–2 ng/mL	~3–6 nmol/L	**Early rise**	The cycle may be moving, but this is not proof of ovulation.
~2–3 ng/mL	~6–10 nmol/L	**LH-surge proxy**	Often corresponds to the initial progesterone rise used as 'day zero'. Confirm the trend.
~4–10 ng/mL	~12–25 nmol/L	**Ovulation range**	Ovulation may be occurring or recently completed. The result must be read with earlier samples.
Above ~10 ng/mL	Above ~25–30 nmol/L	**Post-ovulation**	Ovulation is increasingly likely to have occurred, but the number alone cannot tell exactly when.

Guide only. The cut-offs overlap, differ among assays, and are never a substitute for serial interpretation. Conversion: 1 ng/mL = 3.18 nmol/L.

The overlap is important. Ovulation does not occur at exactly the same progesterone concentration in every bitch, and a value such as 5 ng/mL (approximately 16 nmol/L) could represent a bitch approaching ovulation, ovulating, or already just past it. The previous and following results are what make that number useful.

The usual timeline

At the initial sustained rise, often around 1.5–2.5 ng/mL (approximately 5–8 nmol/L), depending on the assay, we estimate that the LH surge has occurred. Ovulation usually follows roughly two days later, often while progesterone is somewhere within a broad range of about 4–8 ng/mL (approximately 12–25 nmol/L). Dogs then ovulate immature eggs, which generally require a further two days to mature before they can be fertilised.

This is why 'progesterone is 5, or 15, breed today' is too simplistic. For natural mating or fresh semen, longer sperm survival gives us some flexibility. Chilled semen requires tighter planning. Frozen semen has the shortest functional lifespan after thawing and therefore requires the most precise alignment with mature eggs. The intended semen type, the whole curve, vaginal findings and the bitch's history all affect the recommendation.

A useful distinction: Progesterone can confirm that a bitch has entered a luteal phase, but it cannot diagnose pregnancy. A non-pregnant bitch produces progesterone after ovulation too.

Why serial testing matters: two composite examples

These examples are fictional composites designed to show patterns we see in reproductive practice; they are not individual patient records.

Case 1: the number that looked like ovulation—but was not

Molly's progesterone was 2.1 ng/mL (6.8 nmol/L) on Monday. If that result had been treated as a stand-alone 'LH number', chilled semen might have been dispatched immediately. On Wednesday it was 2.3 ng/mL, and on Friday 2.2 ng/mL. Her vaginal cytology remained strongly oestrogenic, and ultrasound showed persistent large follicular structures without convincing evidence of ovulation.

The curve had stalled. This can occur with prolonged follicular activity, a non-ovulatory or abnormal cycle, a split heat, or ovarian follicular cysts. The important information was not that Molly had reached 2.1 ng/mL; it was that progesterone failed to continue its expected rise. Shipping or inseminating on the first number would probably have wasted the cycle and the semen.

Case 2: a normal rise and a useful whelping date

Ruby's results were 0.7, 2.0, 5.0 and 12.3 ng/mL over serial samples. The sustained rise allowed her veterinarian to estimate the pre-ovulatory day zero and then confirm that ovulation had followed. Her breeding was planned for the correct window for the semen being used. More importantly, her expected whelping date was written into the record before she was even pregnant.

When Ruby later appeared restless near term, the team was not guessing from mating dates. They knew whether she was early, on time or overdue relative to ovulation, which changed how her behaviour and fetal monitoring were interpreted.

The other major reason to test: predicting whelping

Mating dates are a surprisingly poor way to calculate a canine due date. Viable sperm may wait in the reproductive tract for up to 7 days before the eggs are ready, and bitches may be mated several times across a wide window. As a result, the interval from first mating to whelping can vary greatly even when the pregnancy itself is normal.

Whelping is much more tightly linked to the hormonal timetable. Most normal bitches whelp at approximately 63 days after ovulation, or about 65 days after the LH surge/initial sharp progesterone

rise. In one study using serial pre-breeding progesterone results, the predicted date was correct within one day for 67% of bitches, within two days for 90%, and within three days for all bitches studied (Kutzler et al., 2003).

That date is clinically valuable. It helps us decide whether apparent early labour is genuinely premature, whether a quiet bitch is actually overdue, when fetal heart-rate changes become concerning, and when a planned caesarean can be considered without delivering immature puppies.

Late-gestation or 'reverse' progesterone testing

Some breeders refer to late-gestation testing as 'reverse progesterone testing': instead of watching progesterone rise around ovulation, they watch it fall before whelping. The phrase is convenient, but late-gestation progesterone monitoring is more accurate.

Progesterone must fall sharply for normal parturition to begin. Low values can therefore show that cervical dilation and whelping are approaching. Research has found that, on particular assays, a result below about 2.8 ng/mL (9 nmol/L) was strongly associated with the onset of cervical dilation within 48 hours, while values around 1 ng/mL (approximately 3 nmol/L) often preceded it by about 24 hours (De Cramer and Nöthling, 2018). Other point-of-care analysers produce different cut-offs, which is exactly why a number copied from the internet should not be applied blindly to a result from another machine.

Late testing is useful when ovulation timing was not done, when the pregnancy is high risk, or when the clinical picture does not match the expected date. However, it provides only a narrowing window at the end. It may require repeated tests and still needs to be combined with behaviour, examination, fetal heart rates and the overall obstetric picture. Whenever possible, it is cleaner and safer to establish the due date at ovulation rather than trying to rediscover it in the final days.

Why does the laboratory matter?

Why do we ask for samples to be sent to Awanui Veterinary rather than using whichever laboratory or in-house analyser is closest? Progesterone results are assay-dependent: different testing platforms can produce meaningfully different numbers from the same sample, particularly around the concentrations where breeding decisions are being made.

Because the trend matters more than any isolated result, serial samples should ideally be tested using the same method from start to finish. We use Awanui because its testing is performed in an IANZ-accredited laboratory by trained staff, and because our timing recommendations and experience are based on the results produced by that laboratory.

In-house analysers can be very useful when rapid results are essential, but they have their own assay-specific ranges and potential biases, and their numbers should not simply be substituted into an Awanui-based timeline, or mixed with Awanui results part-way through a cycle. It is not that every other

laboratory or in-house analyser is “wrong”; using one consistent, dependable testing system allows us to interpret the whole progesterone curve with greater confidence.

How much progesterone is needed to maintain pregnancy?

Canine pregnancy depends on progesterone from the corpora lutea. A concentration above approximately 5 ng/mL has traditionally been considered necessary to maintain pregnancy. However, that threshold is not a treatment trigger on its own. Progesterone naturally varies, assays have bias, and healthy bitches can record lower concentrations than older textbook ranges, particularly late in gestation, then deliver normal puppies (Hinderer et al., 2021).

True primary hypoluteoidism, in which the corpora lutea fail to provide adequate progesterone despite an otherwise viable pregnancy, is considered uncommon. More often, progesterone falls because something else has already gone wrong: fetal death, placental disease, uterine inflammation, systemic maternal illness or an impending normal parturition. In those cases, low progesterone may be the consequence rather than the cause.

Why we do not supplement ‘just in case’

Supplementation may be justified in a carefully investigated bitch with a repeatable downward trend, evidence that the pregnancy is still viable, and a history and clinical work-up supporting luteal insufficiency. It should be managed by a veterinarian who knows the ovulation date and can plan monitoring and withdrawal.

Giving progesterone or a synthetic progestogen without that evidence can create real problems. It may prevent the normal fall required for labour, prolong gestation, cause uterine inertia or dystocia, retain dead or compromised fetuses, and increase the risk of cystic endometrial change and pyometra. Depending on the drug and stage of pregnancy, fetal effects can include masculinisation of female puppies and other developmental abnormalities. Reduced milk production and mammary changes have also been reported.

The key question is not ‘Is progesterone lower than I expected?’ It is: ‘Is there a confirmed, inappropriate and sustained fall while the pregnancy is still healthy—and have we ruled out why it is falling?’

The darker side of progesterone: pyometra

Progesterone is essential for pregnancy, but its effects also help explain why pyometra develops after a season. During the progesterone-dominated luteal phase, the uterine lining becomes secretory, uterine

contractions and drainage are reduced, and local immune defences change. In a susceptible uterus, often one with cystic endometrial hyperplasia, bacteria can then establish a serious infection.

This does not mean progesterone alone 'causes' every pyometra. It creates the biological environment in which the disease occurs, and repeated cycles or exogenous progestogens may increase that risk.

Does pyometra always mean an emergency spey?

Ovariohysterectomy remains the safest, fastest and definitive treatment for most bitches with pyometra, particularly if they are systemically unwell, unstable, not intended for future breeding, or there is concern about a closed cervix, uterine damage or rupture. Pyometra can deteriorate rapidly and is never a condition to manage at home with antibiotics alone.

However, a spey is not the only possible treatment in every case. In a carefully selected, clinically stable breeding bitch, medical management may preserve fertility. The principle is to remove progesterone's effect, usually with the progesterone-receptor blocker aglepristone where available, encourage the uterus to empty, treat infection and systemic illness, and monitor closely with repeat examinations, blood tests and ultrasound. Published series show that fertility can be retained after successful medical treatment, but recurrence remains possible because the underlying uterus has not been removed (Melandri et al., 2019).

The decision is therefore individual and time-sensitive. A bitch chosen for medical treatment needs an owner who understands the risk, can comply with intensive rechecks and will agree to surgery immediately if she fails to improve. Future breeding plans and eventual desexing should be discussed from the outset.

A terminology note: Pyometra is a progesterone-associated infection of the non-pregnant uterus, usually after a season. Postpartum metritis is infection and inflammation after whelping and is a different condition with different causes and treatment decisions.

What breeders should take away

Progesterone is one of the most useful tools we have in canine reproduction, but only when it is interpreted as physiology rather than treated as a pass/fail number. Start early enough to establish a baseline. Use the same validated analyser throughout the cycle wherever possible. Follow the rise until ovulation is genuinely supported. Match the breeding recommendation to the semen type. Record the calculated ovulation and whelping dates. And during pregnancy, resist the urge to treat a low-looking number without first understanding the bitch, the fetuses and the trend.

Used this way, progesterone testing does much more than tell us when to breed. It gives the whole pregnancy a clock, and that clock can be one of the most valuable pieces of information we have when whelping begins.

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Client information only. Individual breeding, pregnancy and pyometra decisions require veterinary assessment and may change rapidly with the bitch's clinical condition.