Canine Breeding Management

Raising a litter of pups can be an extremely involved and rewarding process and one that should never be embarked upon without full consideration of all possible steps and potential outcomes.

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Stages of the canine oestrus cycle

The canine oestrus cycle consists of four stages: proestrus, oestrus, dioestrus, and anoestrus. Here is a brief overview of each stage:

1. Proestrus: This is the initial stage of the oestrus cycle, lasting approximately 9 days on average but can vary from 3 to 17 days. During this time, the bitches ovaries are preparing to release eggs, and oestrogen levels start to rise, leading to the development of the follicles. The bitches vulva may also begin to swell, and she may produce a bloody discharge. She may increase urine marking and have a tendency to roam. Proestrus is the time where she is sexually attractive but refuses to allow mating.

2. Oestrus: This is the stage during which the bitch is receptive to breeding and usually lasts around nine days but can vary from three to 21 days. The bitches oestrogen levels peak, then decline rapidly as her progesterone levels increase. It is at this time the follicles release eggs (ovulation).

   During oestrus, the bitch should display behaviours such as increased friendliness towards male dogs, flagging her tail to expose her vulva, and should allow mating to occur. The willingness of the bitch to accept the male is **not** a reliable indication of ovulation as some bitches will stand for several days before, and after ovulation.

3. Dioestrus: This is the stage that occurs after mating or after the fertile period. It usually lasts around 60 days, regardless of whether the female dog becomes pregnant.

   If conception occurs, during dioestrus the body prepares for, then maintains pregnancy and is strongly under the influence of progesterone. Progesterone remains high during dioestrus regardless of if the bitch becomes pregnant or not. Progesterone levels begin to gradually drop approximately halfway through dioestrus and rapidly decline at the end of this stage which kicks of the whelping hormone cascade.

   Dioestrus ends with whelping if the bitch is pregnant, or with the passage into anoestrus if not pregnant.

4. Anoestrus: This is the period of reproductive inactivity that occurs between cycles, and it usually lasts about three to four months. During this time, the female dog's reproductive organs rest, and progesterone levels are low.

It's important to note that the length of each stage can vary between individual dogs and breeds, and it's best to consult with a veterinarian to understand your dog's oestrus cycle and how to manage her reproductive health.

Oestrus and mating

When does a female dog first come into heat?

A bitch normally has her first oestrus (heat) between 6-9 months of age. It can be common for the first heat to be “silent” and therefore unobserved by the owner. The first heat can also be a “false heat” with bleeding occurring for a few days, then receding, with true heat occurring a few weeks later.

Smaller breeds tend to go into heat earlier with some having their first cycle as early at four to six months old. Large and giant breeds can be up to two years old before they come into heat for the first time.

How often do female dogs come into heat?

On average, this occurs about twice a year or every six months, although it varies from dog to dog. When cycling first begins, there may be a great deal of variability in the time between cycles. This is normal. Some females take 18 months to two years to develop a regular cycle.

Small breeds tend to cycle more regularly than the larger breeds. Three and occasionally four heat cycles per year can be normal in some females.

Very large breeds may only cycle once every 12 to 18 months. In most giant breeds (Great Danes, Irish Wolfhounds, St Bernard, etc.) an oestrus cycle every 12 months is common.

There is no evidence that irregular heat cycles predispose the dog to false pregnancies or pyometra (uterine infection).

How long does a heat cycle (oestrus) last?

Heat cycles vary, but average two to three weeks for most dogs. The heat cycle begins with the first signs of vulvar swelling or vaginal discharge. It ends when all discharge ceases and the vulva has returned to its normal size.

What are the signs of heat?

Vulvar swelling is the first physical indication of an impending heat cycle. However, often the most obvious recognizable sign is vaginal bleeding. This may not become apparent until a few days after the female has actually come into oestrus. Some female dogs experience heavy vaginal bleeding during oestrus, while other dogs have minimal bleeding. If you are concerned, please consult your veterinarian.

From the beginning of the heat period, she will be attractive to male dogs, but will usually not be receptive, or allow mating, until at least seven days into the cycle although this can be highly variable. As the cycle progresses, the colour and appearance of the discharge change. At the beginning, it is usually quite bloody and thick in appearance, but gradually it changes to a thin watery, blood-tinged discharge. The receptive period for mating usually corresponds to this change in the appearance of the discharge but again can be highly variable.

You may also find that she is passing small quantities of urine more frequently. The urine contains pheromones and hormones, both of which signal any interested males that she will be receptive soon.

At what stage of the heat cycle is the dog able to get pregnant?

The bitch usually ovulates at about the time that the vaginal discharge becomes watery; at this time she will usually become receptive to breeding. The eggs that are released at this time are not yet mature and require an additional two to four days before they are fertilised. There is a period of days between when the bitch is most receptive to being mated, and peak fertility of the eggs. Sperm can survive for up to seven days in the reproductive tract which bridges this gap between the bitch being receptive to mating and peak fertility. Once the sperm have gone through a process of maturation, they effectively go to sleep until the eggs are mature. It is for this reason that mating date cannot be reliably used to determine whelping date. Contrary to popular belief, it is not necessary for the female to 'tie' with the male dog to get pregnant.

Fertility regulation and contraception

Surgical sterilisation - Female

If you are not going to breed from your bitch it can be best to have her spayed. This operation can be done from six-months of age, but it may be better to wait until they are more mature, especially in larger breeds as recent studies have demonstrated potential benefits to the dog by delaying de-sexing. Surgery involves removing the ovaries, fallopian tubes, and uterus (ovariohysterectomy).

Ovariohysterectomy (Spaying)

Advantages

- Eliminates risk of pyometra (infection in the uterus). Around a quarter of bitches can be expected to experience pyometra by ten years old if not desexed.
- Eliminates all diseases associated with pregnancy and whelping.
- Eliminates risk of developing tumours associated with the ovaries or uterus.
- Reduction in risk of roaming behaviour.
- Eliminates oestrus cycles and attraction of males.
- Can provide protection against the risk of developing mammary tumours if desexed before the third oestrus cycle with the highest level of protection in dogs desexed before puberty. The evidence to support this protective effect was reviewed in 2012 and was found to be weak therefore the protective benefits may not be as strong as once thought.
- Council registration fees are often reduced.
- Admission to doggy daycare facilities and boarding kennels can require the bitch to be desexed.

Disadvantages

- Increased incidence of hormonal incontinence if desexing is done prior to 16-20 weeks old, particularly in large breed dogs.
- Increased incidence of obesity if food intake not managed.
- Increased risk of cranial cruciate ligament rupture in large breed dogs, if desexing is done before growth plates are closed.
- Mild elevation in risk of developing some types of tumours in susceptible dogs.

Early Age Neutering

Commonly done in shelter situations primarily as a tool to manage overpopulation.

Regulation of the female reproductive cycle

Prevention of oestrus

Heats in the bitch can be prevented by the administration of some hormonal preparations. These hormones inhibit production of the normal reproductive hormones; therefore, oestrus and ovulation are delayed. Several options used to be available, depending on the stage of the bitch's cycle. Because of concerns around side-effects, the number of suitable products is now limited to Delvosterone injections to shorten the length of heat, or to postpone onset if given before the anticipated start of heat. It is important to note that Delvosterone occasionally causes the bitch to "short cycle" and so she may come into heat again much sooner than normal.

Potential side effects

- Pain at injection site.
- Cystic endometrial hyperplasia and uterine infections.
- Diabetes mellitis, Cushing's disease.
- Reduced, or increased time between heats.
- Transient increased appetite and weight gain, and lethargy.
- Hair discoloration at injection site.
- Changes in temperament.

Options for unintended mating

In the event of misalliance (unintended mating) of a bitch, there are a limited number of available options.

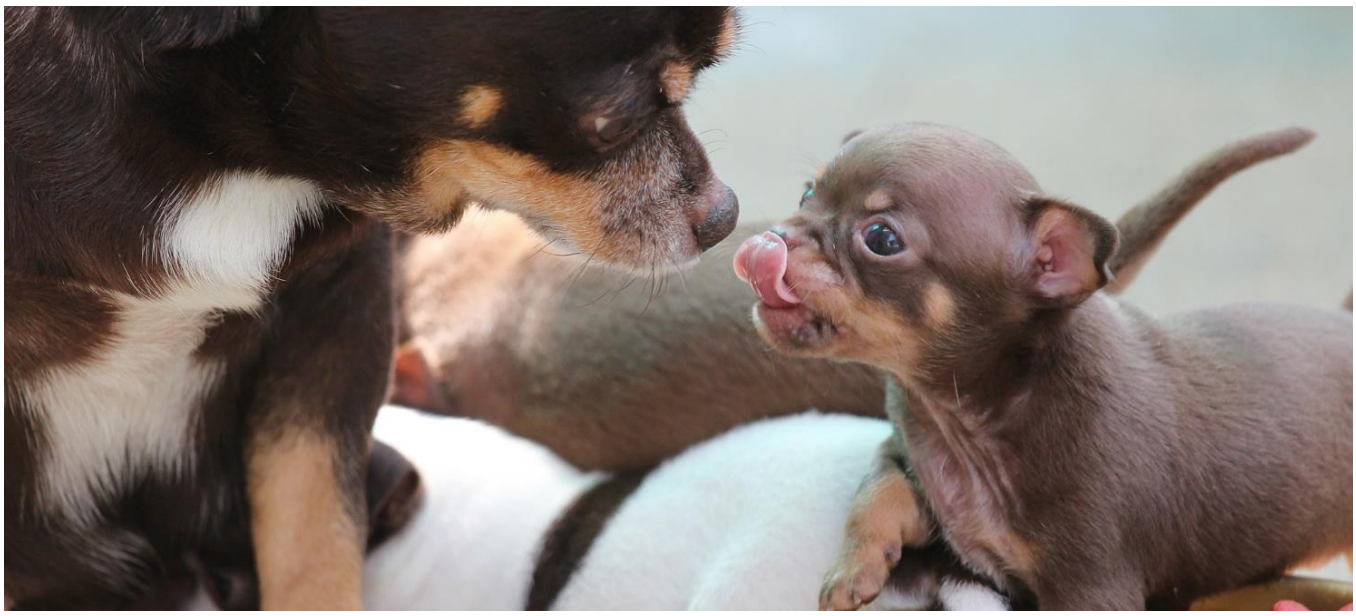
- Permit the pregnancy, if any, to proceed.
- Spay the bitch as soon as signs of heat/season have disappeared.
- Immediately use Alizin (aglepristone), or pregnancy ultrasound at least 21 days after ovulation, but no longer than 40 days, and use Alizin if there are foetuses present.

Potential side effects and complications of Alizin therapy

- Therapy may not be effective however the failure rate is less than 0.1%.
- Uterine infections in 3.4%.
- Inappetence, excitation, depression, and rarely vomiting and diarrhoea
- Pain on injection site.
- Early return to oestrus frequently observed with the interval reduced by one to three months.

Termination of pregnancy

A drug, Alizin, has been developed to terminate pregnancy. This drug can be used from Day 0-40 and has fewer reported side-effects. However, it is expensive and discussion with your vet is important to discuss whether this treatment is appropriate. Alizin also frequently causes a bitch to “short cycle”.



Sterilisation – Male

Surgical castration

The best option if owners do not want to breed from their dog.

Advantages

- Eliminating risk of tumours associated with the testes.
- Reducing the risk of hepatoid gland adenomas.
- Preventing benign prostatic hyperplasia (BPH) and associated diseases. BPH develops in half of all intact male dogs by five years of age.
- Reduction in risk of injury related to roaming and aggressive behaviours.
- Council registration fees for desexed dogs are often lower.

Disadvantages

- Obesity if food intake is not managed in the long-term**.**
- Increased risk of cranial cruciate ligament rupture in large breed dogs, if desexing is done before growth plates are closed.

Chemical Castration – Suprelorin

Non-surgical castration for owners who do not want surgery, or in dogs who are not good candidates for surgery, but still want the benefits of castration, e.g. Owners who may want to breed from their dog at a later date. Dogs where surgery is contraindicated due to anaesthetic risk. This is a very popular medication in some Scandinavian countries where surgical desexing is illegal, and indeed outsells vaccines.

- A great option for working dogs, a New Zealand trial showed no changes in working behaviour, dogs lost all interest in the bitches (even those on heat), no change in body condition, no change in levels of aggression and all owners in the trial would use Suprelorin again.
- The first implant can be given after the dog reaches puberty. A new implant is required every six months to ensure a continuous effect.
- 80% of dogs return to normal testosterone levels in 12 months, 98% of dogs within 18 months. Viable sperm production is expected approximately eight to nine weeks post recover of normal testosterone levels.
- Suprelorin is a contraceptive implant inserted under the skin between your dog's shoulders. It is a similar process to microchipping.
- The implant active ingredient is released steadily and prevents the production of the sex hormone testosterone.
- Testosterone is generally reduced two to three weeks following implantation.
    - *It still takes around six weeks for the dog to become infertile because of remnant sperm stored in the reproductive tract.*
    - Sperm production is then prevented for at least six months.
    - Once the implant wears off, the dog's fertility gradually returns.
    - There are no significant associated side effects.

Semen Freezing

The ability to collect, freeze and store semen from dogs was first described in 1954. Since that time, improvements in freezing and insemination techniques, in conjunction with better methods to monitor the optimum time to inseminate the bitch during her cycle, have meant that these reproductive technologies are a commercial reality.

Why freeze canine semen?

There are many reasons for freezing canine semen. Perhaps the most important reason is to preserve and insure the breeding potential of a dog against loss, death or infertility. With the ability to be stored indefinitely, frozen semen does not degenerate, and we have had pregnancies as a result from semen that was over 30 years old!

Furthermore, freezing semen allows for the transport of genetic material both within and between countries. This obviously increases the marketing potential for stud dogs located in countries such as New Zealand where shipment of dogs to the northern hemisphere for mating is impractical, and likewise allows for the importation of genetic material into New Zealand from overseas, thereby increasing the gene pool.

The use of frozen semen, rather than natural mating, also allows a dog to be used for several breeding's on the same day and in different places.

When is the optimal time to freeze semen from my dog?

Ideally semen should be collected from males that are between 18 months and four years of age. From five years of age onwards, the incidence of prostatic disease increases, which can have an adverse effect on semen quality. While an older male can still be frozen, a better collection can be expected from a young, mature dog. Therefore, it is better to collect and store a dog at a young age based on potential, rather than wait until a male is in great demand but unfortunately much older.

Ensure the male has been fit and healthy both at the time of collection and for the previous few months. A sick, or stressed dog will not provide a quality collection. Furthermore, a high fever or other illness in the recent past can adversely affect semen quality for several months after the event.

If the male is over six years old, has a history of prostatic disease, or has questionable fertility, it may be advisable to have a semen evaluation and "test-freeze" performed before committing to storage of large amounts of semen.

The semen freezing process

Once the semen is collected a sample is removed and assessed under the microscope for a number of parameters including motility, concentration, morphology, and cytology. At this point, if semen quality is marginal, a decision can be made to delay freezing to another time or to investigate potential causes for the poor-quality semen. If the semen is of good quality and meets the minimum required standards to be frozen, the sperm rich fraction of the ejaculate is diluted in a special fluid called "semen extender" and cooled to 4°C over several hours before being loaded into 0.5 ml straws and rapidly frozen to -196°C in liquid nitrogen. The freezing extender contains several ingredients to protect the sperm through the cooling, freezing and thawing process, including egg yolk, antibiotics, and chemicals to protect the sperm during freezing (cryoprotectants).

Once frozen, one "test straw" is immediately thawed to assess how well the sperm survived the freeze-thawing process. The motility and forward progressive motion of the thawed semen is assessed using a powerful microscope immediately after thawing and then again 10minutes after incubation at 37°C.

How much semen should I freeze?

There are many different semen-freezing techniques. Semen can be frozen in either pellets or in straws, however, there is no difference in pregnancy rates between semen frozen in each of these forms. More important factors affecting the quality and fertility of frozen-thawed semen is the operator (someone with experience and understanding in sperm cryobiology and semen freezing), age of the male at the time of collection, inherent fertility of the male, quality of semen at time of collection, semen freezing technique and freezing extenders.

At TCI Glenbred, we use the Uppsala canine freezing technique and extenders. This involves freezing semen in 0.5 ml straws with a total of 100 million sperm per straw. The recommended minimum number of motile sperm required per "intrauterine artificial insemination (AI)" or per "dose" or "mating" is 100 million. However, we aim for at least 150 million sperm per mating. Therefore, the number of straws required per mating with frozen semen depends on how well the semen freezes and at what concentration the semen is frozen at. On average, two straws per mating are required

The number of straws frozen per semen collection varies between breeds and individuals. Anything from none to 25 straws can be collected. An average collection will produce approximately five to 10 straws.

Once the semen is frozen, it is stored at -196°C in a large tank containing liquid nitrogen. Once frozen the semen can be stored indefinitely in liquid nitrogen.

Shipment of frozen semen: National and international export and import once frozen, semen can be shipped within and between countries in specially designed shipping containers so long as they meet biosecurity requirements.

There are different import requirements for different countries and unfortunately these can change without notice. Furthermore, there are health requirements that must be met at the time of collection of the ejaculate if intended for exportation. A large amount of paperwork is often involved with the exportation and importation of frozen semen.

Further information can be obtained from the MPI website: www.mpi.govt.nz

Should I breed my bitch?

Purpose of breeding

A bitch should only be bred for the right reasons. Some less-convincing reasons include, “so that the kids can see the puppies born”, and “it will make the bitch calmer in her temperament”.

It is important to only breed the bitch if she is of excellent health and temperament and that if suitable homes are lined up for the puppies. Improving health and temperament traits from generation to generation is an important goal to strive to.

Age and stage

Once the bitch is physically and mentally mature, she can be bred. It is better for the bitch to be bred younger, from her second season. Being younger means she is at peak fertility, and reduces risk of issues at whelping.

As the bitch gets older her fertility will decrease with lower pregnancy rates and smaller litter sizes in general. There is also an increased chance she will need intervention at whelping. It is best that a bitch is not bred once she is 6 years old.

The New Zealand Veterinary Association Companion Animal Veterinarians recommend limiting the number of litters per bitch to three. With this number, a suitable daughter to continue the line should be produced while reducing the welfare impacts on the individual breeding bitches.

If multiple litters are intended, is best to breed the bitch back-to-back (ie. not skipping heat cycles) as long as her physical condition and age are suitable. Non pregnant cycles are at risk of developing pyometra, an infected uterus which is a life-threatening condition. Therefore the ‘ideal’ situation for a bitch having multiple litters is to start breeding the bitch once she is physically and mentally mature (typically the second or third heat), breed three litters back-to-back and then de-sex to avoid the risks associated with unmated cycles (pyometra). The bitch can also then be ‘re-homed’ to a pet home at a younger age if she is in a breeding kennel situation.

Health testing

Before you breed your bitch, you must consider the New Zealand Animals (Dogs) Code of Welfare (2010) minimum standard which says that “all reasonable efforts are made to ensure that the genetic make-up of both the sire and dam will not result in an increase in the frequency or severity of known inherited disorders”.

Consult with your veterinarian and visit www.dogsnz.org.nz to understand genetic health issues related to the breed or crossbreed of your bitch and stud dog. You should then take all reasonable steps to eliminate or minimise these diseases in the puppies.

If you do not take this responsibility seriously you are at risk for dispute tribunal claims from puppy purchases if the puppies require corrective veterinary care due to preventable inherited disease.

Health tests include DNA testing, cardiac and eye certification as well as orthopaedic diseases such as hip and elbow dysplasia x-rays. It is also important to consider diseases related to exaggerated features such as short noses, excessive skin folds, long ears, short legs and so on.

Available homes

Overpopulation of dogs in New Zealand is a significant problem. Ensure before you breed your bitch, that you have a good pool of suitable puppy owners lined up.

Risks of breeding

Breeding your bitch is not without risk and can involve significant cost. It is a good idea to plan on having at least $4000 set aside to cover the cost of an emergency caesarean if required plus additional feed and medical care for the bitch and/or puppies if needed.

There is a small, but significant, risk of maternal and neonatal death should complications arise at whelping time.

Selection of stud dog

It is important to pay the same attention to stud dog selection as breeding bitch selection. He should have a suitable temperament and have undergone appropriate health testing for the breed or crossbreed. It can be difficult to interpret health test results and is almost never a black and white answer. Becky at TCI GlenBred is happy to provide genetic counselling in this situation.

When is the best time in my bitch's cycle to breed her?

Optimum breeding time

Breeding management should involve a combination of strategies. For optimal results please get in touch with Becky prior to the bitch coming into season so that a plan can be made for ovulation planning and breeding guidance.

Behavioural signs of oestrus.

This can be difficult and varies widely between bitches, and individual cycles. Behavioural signs of receptivity do not necessarily relate to the peak fertility stage and so cannot be relied on. Most ovulate and are receptive around the 7th – 18th day of oestrus. The discharge can be less bloody (often described as a 'salmon colour') and the female can be actively looking for a male., Ovulation may occur either early or late during the heat cycle.

Physical signs of oestrus.

Detect first day of heat which is the first-time blood discharge is noticed. As the bitches vulva starts to swell you can check for the blood discharge daily by dabbing a white cloth/tissue against it. On the 7-9th day of bleeding the bitch should have a serum progesterone test done.

Serum progesterone test

This measures the progesterone level in the blood. This test is very sensitive and accurate and is used to predict the date of ovulation. Some bitches may require several tests over a period of time to best determine breeding date.

The other significant advantage of using progesterone testing is that an accurate estimated whelping date can be calculated. This can be a considerable benefit should the bitch require caesarean section or other intervention at time of whelping.

Vaginal cytology

Vaginal smears can be done to check cytological changes in the cells of the bitches reproductive tract. It can be used in combination with progesterone testing if there is a concern about infection and to support progesterone determination of stage of heat.

Vaginoscopy

TCI GlenBred can offer direct examination of the vaginal lining using an endoscope which is often done at time of artificial insemination where the trans-cervical endoscope is used.

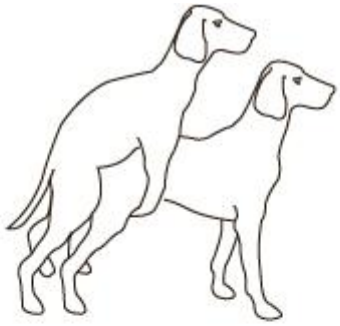
What can I do to ensure mating is successful – natural matings.

The time of mating is critical, and it is recommended that you have tested your female to determine the optimal days for breeding. As above, this also provides valuable information for accurate whelping date determination.

If progesterone testing is used to determine peak fertility, only one mating is usually necessary, however can be repeated 24-48 hours later if the bitch is still standing. Freshly ejaculated sperm live for up to 7 days in the bitch's reproductive tract and so covers her fertile period well.

My female had tied well with the dog. What does this mean?

During coitus, part of the dog's penis (the bulbis glandis) swells and enlarges. The female's vaginal muscles contract against the bulbis glandis, thus preventing the penis from being withdrawn. This is the tie that is considered a desirable feature of a successful mating. It is important to note that pregnancy can occur without a tie. Once tied the male dog will often step over the female or be turned by handlers into a position so that the animals are back-to-back. The tie will usually last for five to ten minutes.

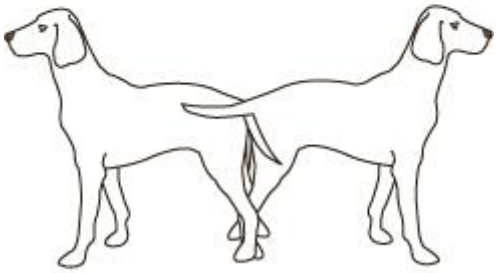


Initial phase of coitus

I found my dog tied to a female dog during a mismating. Was there anything I could do to separate them?

There is little point in trying to separate animals that are locked together in this way. Buckets of cold water, water pistols, cap guns, and so forth do little to speed up the process of separation and merely upset the dogs. In fact, forced separation can result in serious injury to the female and should be avoided.

If a mismating has occurred, discuss it with your veterinarian as soon as possible.



"Tied" phase of coitus

Other breeding options – artificial insemination

The most important aspect when discussing artificial insemination (AI) is to realise that there are many factors that play a role in whether or not your bitch becomes pregnant after AI. These factors include type of semen (fresh vs chilled vs frozen), semen quality and quantity, age and fertility of both the stud dog and bitch, site of semen deposition (intrauterine vs vaginal) and time of insemination… just to name a few!

Types of Semen

Insemination can be performed using three types of canine semen: fresh, fresh-chilled, and frozen.

Site of semen deposition – artificial insemination techniques

When using frozen-thawed semen or low numbers of potentially compromised fresh or chilled semen, deposition directly into the UTERUS is carried out to maximise the chance of pregnancy. At TCI GlenBred we use the TCI technique and strongly recommend our clients do not seek invasive surgical AI.

Transcervical insemination (TCI)

This is a non-surgical, non-invasive insemination technique whereby a catheter is passed through the cervix into the uterus using a specialised rigid endoscope. The semen is then flushed through the cervix and deposited directly into the uterus. This procedure can be visualised by both the veterinarian performing the procedure and the owner of the bitch because the endoscope has a camera fitted onto it which projects an image onto a television mounted on the wall (see Fig 3). This internationally recognised technique was developed in New Zealand by Dr Marion Wilson. It has been used for breeding dogs very successfully for over 30 years. It has the advantages of being anaesthetic and sedation free, non-surgical and relatively stress free. It also has the distinct advantage in comparison to surgical AI in that more than one insemination can be carried out during the bitch's heat.

However, there are a few bitches, often for behavioural reasons where it may not be a feasible option to perform this without sedation, in those cases a short-acting sedative is used to make the procedure safer and less stressful for the bitch. Multiple studies show that TCI results in less trauma to the bitch, and higher conception and larger litter sizes when compared with surgical AI.

We use a Karl Stortz TCI endoscope which facilitates TCI in large breed and maiden bitches and its narrow and slender tip is able to be easily passed through the cervix and into the uterus allowing visualisation and sampling of any abnormalities that are detected. This is a fantastic diagnostic tool for investigation of female infertility cases.

Surgical intra-uterine insemination
This technique involves a general anaesthetic and surgery with the associated risks. An incision is made into the abdomen, the uterus is then identified and exteriorized. The semen is then injected directly into the uterine horns. Due to the invasive nature of this technique, we elect not to use surgical insemination unless the bitch's cervix cannot be successfully catheterised by TCI. This technique is invasive and involves significant potential complications associated with surgical incisions and anaesthesia.

Vaginal insemination
When using fresh semen with adequate sperm numbers and sperm quality, deposition of semen into the very end of the vagina can result in pregnancy and litter sizes equivalent to natural mating's.

There are many different types of catheters that can be used for vaginal AI. We insert a special artificial insemination catheter (MAVIC) to the very end of the vagina. At this point a bulb at the end of the catheter is inflated to mimic the swelling of the dog's bulbus glandis during mating. This not only prevents back flow of semen but stretches the vaginal wall resulting in oxytocin release and stimulation of vaginal and uterine smooth muscle contractions, facilitating transport of the sperm into the uterus. After the bulb is inflated, fresh semen is slowly injected down the catheter into the far end of the vagina. This is then followed by warm canine semen extender which functions to help flush the semen into the uterus in the same way prostatic fluid does during natural mating.

This is a technique that can be used in all bitches, is non-invasive, requires less skill and equipment than the intra-uterine AI techniques. It is often used in maiden bitches and studs that fail to 'tie' or mate, which can be due to a number of reasons.

Vaginal AI is not used for AI with frozen semen. As well as the greatly reduced lifespan mentioned previously semen is frozen in significantly lower numbers (i.e. 100 million motile sperm per 'AI dose') than what a fresh or chilled insemination dose contains.

Therefore, deposition of low numbers of fragile frozen-thawed sperm into the hostile vaginal environment results in low numbers migrating through the cervix into the uterus and reaching the fallopian tubes (oviduct), which is where fertilisation takes place. This obviously results in a lower pregnancy rate and litter size.

Importance of semen handling and assessment
No matter what type of semen (fresh, chilled, or frozen) or the method of artificial insemination that is used to deposit the semen, careful and skilful handling of the semen is essential. Furthermore, assessment of a sample of semen by a qualified and knowledgeable person prior to insemination also plays a critical role in the maximisation of pregnancy rates.
In conclusion, AI is a very useful reproductive management tool. It allows the transport of
semen both nationally and internationally. However, management of both the stud dog and bitch is critical to
maximise both pregnancy rate and litter size after AI.

Pregnancy

How long does pregnancy in the dog last?

Pregnancy, also called the gestation period, normally ranges from 57 to 65 days with an average of 63 days from ovulation.

With a planned breeding without progesterone testing, you should record the date of mating. If there are two matings, make a note of the exact dates and expect birth to occur between 63 and 65 days later. If progesterone testing is used, estimated due date is 63 days from ovulation no matter when the mating date was.

Immediately after my bitch has been mated, is there anything I should do?

Make sure that she does not have the opportunity to mate with any other dogs. Remember that oestrus or heat will continue for several more days and she could theoretically become pregnant from another dog during this period. After a planned mating, it is a good idea to allow her to rest quietly for a few hours.

Should I change her food?

It is important that she be in good physical condition before she is mated. Both the bitch and stud dog should be examined by a veterinarian prior to mating.

After mating, food intake should remain the same during the first two-thirds of pregnancy (approximately six weeks after mating). Make sure you feed your dog a premium, high-quality diet as advised by your veterinarian during pregnancy. Discuss nutritional supplements and vitamins with your veterinarian before giving them to your dog.

What do I do after the sixth week?

After the sixth week of pregnancy, your dog should gradually increase her food intake; high energy, low fibre foods are recommended. As the foetuses increase in size, abdominal pressure increases, and frequent small meals are advised. Diets containing high levels of omega-3 Docosahexaenoic Acid (DHA) have been shown to improve the health and development of puppies and should be considered. Discuss DHA-supplemented diets for your pregnant dog with your veterinarian.

During the last three weeks of pregnancy, your dog's food intake should increase by up to one and a half times the normal level, by feeding smaller meals more frequently.

Once the bitch has whelped, switch to a good quality puppy diet, or a diet specific to pregnancy and lactation, that is fortified with calcium and other minerals to support lactation and reduce the risks of developing milk fever (hypocalcaemia – low blood calcium). Introduce slowly over a few days so the mum does not develop gastrointestinal signs due to a sudden diet change. Peak lactation is usually three to six weeks after whelping.

If you are unsure about any supplements or medication, please do not hesitate to contact your veterinarian. Some commonly used drugs should be avoided if your dog is pregnant.

How can I be certain my dog is pregnant?

Abdominal ultrasound is currently our method of choice for pregnancy diagnosis. Depending on the experience of the vet, equipment and patient, a positive diagnosis can be made as early as three weeks after breeding. Most scans performed after day 28 of the pregnancy are reliable. Due to positioning within the abdomen, it can be difficult to count the number of foetuses on an ultrasound with accuracy.

An abdominal radiograph (x-ray) during the last week of pregnancy can be a more accurate method for determining litter size and should be performed on pregnant bitches if there is a concern about low litter size. Bitches who have small litters (one to two) are at risk of requiring caesarean section and so need to be more closely monitored.

Accurate counts in bitches with larger litter sizes can be more difficult due to the size of the bitch at full gestation and the difficulty of achieving a good quality x-ray image to count from. It can also cause significant distress to the bitch being laid on her side while she is uncomfortable, as the image is taken. It can be better to instead x-ray the bitch if you are concerned that she has not yet passed all of the puppies at the end stage of whelping.

Should I change her routine as pregnancy advances?

As pregnancy progresses, intra-abdominal pressure increases and so does the mother's food requirements. The dog usually needs to have an increased number of smaller meals rather than an increased quantity per meal. Let your pet decide how much physical activity she needs. This depends on the number of puppies and the amount of intra-abdominal pressure she is experiencing. Do not over exercise a pregnant female. Check for any vaginal discharges and contact your veterinarian if you have any concerns.

One of the most effective ways to prevent complications such as milk fever is to switch to a good quality puppy diet only once the bitch has whelped. These diets are fortified with calcium and other minerals to support lactation and reduce the risks of milk fever. Or there are specific pregnancy and lactation diets which can be fed from 6 weeks gestation.

Over supplementing with calcium and other supplements can increase the risk of developing milk fever so discuss with your vet before adding supplements or changing diets. Never give calcium supplements prior to whelping otherwise downregulation of the bitches own calcium production can occur.

Whelping

What should I do to prepare for the birth of the puppies?

After mating, many females will show changes in behaviour, often becoming more affectionate. However, some pets will become uncharacteristically irritable and may even act aggressive during pregnancy. Be sensitive to your pet's behavioural changes and be sure to alert your veterinarian if you are concerned.

Does morning sickness occur in pregnant dogs?

Although it is not common, some dogs do experience a few days of vomiting (morning sickness) usually followed by the development of an increased appetite that persists throughout pregnancy. There is also a normal decrease in the desire for exercise and physical activity during the first and last two weeks of pregnancy.

My dog seems to want to hide in strange places. Is this normal?

During the last week of pregnancy, the female often starts to look for a safe place for whelping. Some pets appear to become confused, wanting to be with their owners and at the same time wanting to prepare their nest. It is a good idea to get your pet used to the place where you want her to have her puppies well in advance of whelping. In spite of your good intentions, some dogs insist on having their puppies near the owner; this may be on your bed in the middle of the night. Be warned!

If she does start whelping in my bedroom, what should I do?

It will be far less stressful for everyone to allow her to continue in her chosen place. Make sure you spread lots of old newspaper and, if possible, cover the carpet with a plastic sheet covered by sheets or newspaper. It is common for foetal fluids to be coloured green. These stains can be difficult or impossible to remove.

Once your pet has finished whelping, try gently moving her and new family to your chosen place. If your pet insists on being near you with her puppies, allow her. A whelping or nesting box in a quiet corner of the living room is preferable to an anxious mother constantly leaving her puppies.

Should I be present during whelping?

Some dogs like the owner to be with them the whole time they are in labour. Others prefer to have their puppies in seclusion. If your pet chooses to be left alone, try to avoid intruding any more than necessary.

What should I do to be prepared?

Make sure you have plenty of clean newspapers and sheets or towels.

Select the place where you would like her to have her puppies and put a suitable whelping box in that location The whelping box should be large enough for her to move around freely, with low sides so that she can see out and easily move in and out. A large cardboard packing case with an open top and an opening cut out of the side is ideal for smaller dogs. Be sure to ask your veterinary healthcare team for more advice on making a whelping box for your pet.

Line the bottom of the whelping box with plenty of newspaper. There will be a large amount of fluid at the time of whelping. If sufficient layers of newspaper and cloth are in place before whelping, you can remove soiled layers with minimum interruption to the mother and her newborn puppies.

Non-absorbant bedding, which is easily washed, can be used to cover the newspaper. However, during whelping, plain newspaper is more absorbent and the puppies are less likely to get hidden beneath it.

How will I know when my dog is going to start having puppies?

Progesterone testing during breeding is the most accurate way to determine when the bitch is due. If this has not been done at time of breeding, progesterone testing can be used before whelping where levels drop rapidly 12-24 hours before a bitch is due to whelp. This can be variable however, and often does not occur if there are small numbers of puppies in the litter.

Some females stop eating during the last day of pregnancy, although this is certainly not universal. In most cases, a drop in rectal temperature, of a full degree from normal, occurs in the last 24 hours and signals impending labour. Rectal temperatures can be done twice daily at exactly the same time of the day, for a week in the lead up to due date. Around 80% of bitches will experience this drop which is related to the drop in progesterone.

She will often go into a corner or a quiet room and start scratching or digging to make a bed. These signs may last for up to 24-hours and are part of first stage labour.

Second stage labour is the stage of delivery. Your dog will start to strain. If intense straining continues for more than thirty minutes without any signs of a watery discharge ("water breaking") or puppies, you should contact your veterinarian. Most dogs experience no complications with delivery. You should stay with a first-time mother until at least one or two puppies have been born to make sure that everything is going well.

If there are no problems, further attendance will depend upon the desire of your pet and the situation. As mentioned previously, some dogs prefer you to be present while others prefer to be alone.

My dog has not had puppies before. Do you think she will be all right left alone during whelping?

Primagravidas, or females having puppies for the first time, should be kept under surveillance until you think they have finished just in case they get into trouble. Make sure your dog is properly caring for her newborn puppies, particularly if she is still in labour.

Some females are more concerned with straining to produce the next puppy than caring for the puppies already delivered. If that is the case, place the puppies in a small cardboard box containing a towel-wrapped bottle filled with warm (not hot) water, and covered with another towel to keep them warm and protected until the mother finishes delivery.

How long will whelping take?

Delivery times vary. Some dogs may complete delivery of all the puppies within two to three hours. Brachycephalic breeds, or breeds with large, round heads such as Bulldogs, Boston Terriers, and Pekingese tend to have deliveries that are more difficult; sometimes they will produce one or two puppies relatively quickly and then rest for a while before labour starts again.

If your dog has produced at least one puppy and does not strain again within two hours, you should contact your veterinarian. If the bitch has been straining continuously for a couple of hours and has not had a puppy, she requires immediate veterinary attention.

How are puppies normally born? Do they usually come out backwards?

Puppies are usually born headfirst with the forelegs extended, called an anterior presentation. Posterior presentation, in which the puppy is born with tail and hindlegs emerging first, is also normal for dogs. This is not a breech presentation.

A breech presentation is one in which the hindlegs are extended forward and the tail and bottom are presented first. This is abnormal and may require a caesarean-section or veterinary assistance to deliver the puppy. Some breech presentations can result in a normal delivery. If a puppy's tail is seen hanging from the vulva or there is a lump just behind the vulvar lips and your pet is straining, contact your veterinarian.

Should my dog pass afterbirth after each puppy?

Each puppy is enclosed in a sac that is part of the placenta or afterbirth. This sac is usually broken during the birthing process and passes through the vulva after each puppy is born. You may not notice any afterbirth since it is normal for the female to eat them. The hormones in the afterbirth help with milk production. Sometimes a mother will have two or three puppies and then pass several of the afterbirths together.

Is it important that I count the afterbirths?

It may be difficult to obtain an accurate count of the number of afterbirths since most dogs will eat them quickly. If the afterbirth is not passed, it usually disintegrates and passes out of the uterus within 24 to 48 hours. This usually happens when the dog defecates.

If the mother develops a bloody or smelly vaginal discharge 24 to 48 hours after delivery, veterinary help should be sought.

How soon should a puppy be born after it starts emerging from the birth canal?

In a normal delivery, a few contractions will produce the puppy. Ten minutes is reasonable. Following delivery, the mother will lick and chew at the puppy and often appears to be treating it quite roughly. This is normal behaviour and stimulates the puppy to start breathing. During the chewing and licking, she tears open the birth sac and exposes the mouth and nose so that the puppy can breathe. You will realise all is well if the puppy starts to whimper or cry within a minute or so after birth.

Sometimes the placenta or afterbirth is delivered immediately after the puppy and is attached by the umbilical cord. The mother normally chews on the umbilical cord and breaks it about an inch from the puppy, consuming the placenta at the same time. In some dogs, the mother seems to become over enthusiastic and may lick and chew at the puppy until she injures it. Therefore, it is advisable to observe the dog as she cares for her newborn puppies, particularly if it is her first litter.

I have heard that some females will have a puppy that is still attached to the afterbirth, then run away and leave it. If this happens, what should I do?

This can occasionally happen in first-time mothers. If this happens, it is important that you ensure the puppy's mouth and nostrils are clear of any afterbirth or membranes. Remember the puppy is born in a fluid filled sac that usually breaks during birthing.

If the puppy is still enclosed in the sac, break it open as quickly as possible. Clean the puppy's face and nostrils and then gently blow on its face to try to stimulate breathing. If the afterbirth is still intact, hold the umbilical cord between your finger and thumb with the puppy resting in the palm of your hand and cut the cord with a pair of scissors approximately an inch from the puppy. Applying pressure to the stump with your fingers for a few seconds will usually stop any bleeding. Otherwise, you can tie it with clean thread.

Next, hold the puppy in a towel and gently rub it until it is dry. The puppy should then start to whimper and breathe normally. The tongue should be pink. Once it is breathing normally, you can offer it to the mother. If she is more interested in delivering further puppies, place the puppy in a box with a warm water bottle covered by a towel. Be sure to cover the puppy with a warm towel to keep it warm.

What happens if the puppy is visible, but my dog can't deliver it?

Speed is of the essence in such situations, especially if it is a posterior or breech presentation. If the puppy is coming headfirst make sure that the foetal membranes covering the visible part of the mouth and face are removed so that it can breathe. If the puppy is coming backwards, speed is important otherwise the puppy will suffocate.

Regardless of whether the puppy is coming headfirst or hind first, take a piece of clean tissue or clean cloth and gently grab the puppy, pulling it downwards at approximately forty-five degrees to the angle between the mother's spine and the hind legs. Pull constantly and gently, not just when the mother strains. Constant, gentle traction (pulling) on the puppy will stimulate additional contractions. Once the puppy has been born, clear the foetal membranes from its nose and mouth and then cut the umbilical cord. If the afterbirth is still inside the mother, do not worry.

It is important to stimulate the puppy by blowing gently down the nostrils and mouth to clear any fluids and debris, as well as stimulating it by gently rubbing it with a towel until it starts to breathe.

If you cannot dislodge the puppy or if it appears to be painful to the mother, seek veterinary help immediately.

Is it true that the puppy will die if it is not stimulated immediately after birth?

If the puppy is born within the foetal sac, it will be unable to breathe. If the mother does not break the sac, you should remove it by following the above instructions.

Fortunately, most puppies break the sac as they are passing through the birth canal.

I understand puppies can drown in their own foetal fluids. Is this true?

Newborn puppies may try to breathe while still within the fluid-filled sac. The fluid then enters the lungs. This is an emergency.

If a puppy has breathed in foetal fluids, its breathing will sound raspy and gurgly. You must remove this fluid as soon as possible. Vet clinics use suction bulbs to remove this fluid. Another option is to hold the puppy in the palm of your hand, cradling the head between your first and second fingers. Use your other hand to support and steady its body. Angle the puppy downwards, headfirst, and vigorously rub their chest. Gravity will help the fluid and mucus flow out of the lungs and mouth. Repeat this several times, being sure to check the color of the tongue and listening to the breathing. The tongue should change from a grayish blue color to pink if you are successful. If it remains bluish, continue the massage process. Once the puppy is breathing, place it in the warm box.

Is it possible to keep the puppies too warm?

The puppies have been living in a temperature of 38.5°C which is pretty warm by human standards. Immediately after birth, puppies are unable to control their own body temperature and are dependent upon external warmth.

Newborn puppies lack the strength to move away from a heat source and can easily become overheated. If you are using heat lamps, be sure to monitor the temperature with a thermometer. Keep the ambient temperature in the whelping box at around 28-32°C during the first few days.

Should I continue the heat source if the mother is nursing her puppies?

It is usually not necessary to provide external heat if the mother is properly caring for her puppies and the whelping room is warm. If a heat lamp is used, extreme care must be exercised; otherwise, the mother and puppies can easily become overheated.

Stages of labour

Prediction of whelping (parturition) date

1. Pregnancy Length:
    - Gestation = 63 days from ovulation.
    - 68 days from early mating.
    - 57 days from late mating.
2. Accurate prediction of whelping date is important in cases of…
    - High risk of dystocia (difficult labour).
    - Elective caesarean section.
    - Diagnosing uterine inertia, and intervention in whelping.
3. Temperature: Take bitches temperature two times at the same time every day from 55 days after first mating. Temperature drop is a good indication of progesterone drop, which precedes parturition and occurs in 80% of bitches. Look for temp drop of >1°C. Often temp can be <37.5°C. Temp may then rise again, and parturition starts approximately 24hrs later.
4. Progesterone testing can be used to determine when the bitch is due. If this has not been done at time of breeding, progesterone testing can be used before whelping where levels drop rapidly 12-24 hours before a bitch is due to whelp. This can be variable however, and often does not occur if there are small numbers of puppies in the litter.

Impending parturition

- Onset of lactation - usually in last week of pregnancy.
- Nesting behaviour e.g. tearing up paper, disappearing under the house etc.
- Abdominal relaxation – abdomen “drops” in readiness for delivery.
- Vaginal discharge 6-24hrs before first signs of labour.

Stage I – Cervical dilation

- The first stage of labour is characterised by uterine contractions and cervical dilation. It can usually be recognised by the behaviour of the bitch.
- Nesting behaviour.
- The bitch may appear restless, nervous, anorexic and tremble or shiver. Probably the most characteristic sign is that of panting; both pulse and respiration rates are increased. Occasionally the bitch may vomit. She may pace and circle at the beginning of this stage, then seek seclusion and nest towards the end.
- Stage I lasts an average of six to 24hrs. No owner assistance is usually required as long as privacy is provided for the bitch.

Stage II – Delivery

- The stage of delivery where each foetus passes through the cervix and vagina to be born. The average length of this stage is three to six hours, although some normal bitches may take up to 12 hours.
- The bitch usually lies down on her side, and contractions of the abdomen can often be observed. At this stage, the bitch should not be disturbed unnecessarily as she can voluntarily inhibit labour at this stage if upset.
- As each puppy passes through the vaginal canal the fluid filled membrane (chorioallantois) surrounding it ruptures or is ruptured by the bitch’s teeth at the vulva. The amnion is the membrane which covers the foetus at birth. About 40% of foetuses present backwards, or breech. This presentation does not usually cause problems in dogs.
- Puppies are delivered, on average, every 30 to 60 minutes until labour is complete. The time interval between them, however, is irregular, and the mother may deliver a few and then rest for minutes to hours before completing parturition.
- Immediately the puppy is born the mother will lick it vigorously to remove the membranes from its head and to promote respiration. She will sever the umbilical cord with her teeth and probably eat the placenta.

Owner assistance during this stage can increase puppy survival. As a rule, an owner should not typically attempt to pull a puppy when presented at the vulva, as foetal limbs are easily damaged. Gentle assistance may be attempted after 15 to 20minutes of non-productive straining by the mother. If the mother cleans the pup the owner should not interfere; if not, the owner should quickly dry the puppy's head with a towel, wipe fluid from the nostrils and mouth, and vigorously rub the pup. The pup can be held head down to encourage draining of mucus from the lungs and throat. The mother should be left to sever the umbilical cord, but if she doesn't, clean cotton or dental floss can be used to tightly tie the cord approx. 2cm from the puppy's abdomen.

The pups should be left with the bitch; she may not nurse them until labour is complete, but they need her warmth, care, and physical contact.

Stage III – Expulsion of the placenta

Most bitches expel the placenta immediately after delivering the puppy, or within five to 15mins. Owners should count the placentas to ensure one has been delivered for each pup. Placentas can be removed or left for the bitch to eat.

The uterus returns to normal size over the four to five weeks following birth. For the first three to four weeks a green to red-brown discharge, lochia, may pass from the vulva. This may be distinguished from discharge due to uterine infection, metritis, by absence of foul odour. Also, the normal bitch discharging lochia will not show signs of illness.

Problems at Birth

What happens if my dog has trouble delivering her puppies?

Although most dogs will give birth without the need for veterinary assistance, problems can arise which require veterinary attention. It is important to closely monitor your pet during birthing and seek veterinary care if you have any concerns.

How will I know that she is starting?

When whelping or birth is imminent, the female often stops eating (although this is not always the case) and her rectal temperature often drops at least one degree from her normal. The bitch will often go into a corner or a quiet room and start scratching to make her bed. If you see any of these signs, you may wish to notify your veterinarian since this is the first stage of labour, when the birth canal starts to dilate.

This is followed by second stage labor when the female starts to contract her uterus forcibly. These contractions start gradually and increase in intensity, frequency, and duration. If intense contractions have been occurring for 20 to 30 minutes without a puppy being born, it is important to contact your veterinarian.

You should contact your veterinarian if any of the following occur:

- You observe a green discharge from the vagina without puppies being born.
- More than one hour has elapsed since the onset of straining with no pup born.
- The mother strains for 10 to 15 minutes with a puppy or a fluid filled bubble stuck in the birth canal.
- The mother has a rectal temperature of more than 39.5°C.
- You observe fresh bleeding from the vagina which persists for more than 10 minutes.
- More than two hours between pups

Are puppies, like babies, sometimes born prematurely?

Premature delivery does occur in dogs, but it is not as common as you might think. Often these so-called premature deliveries have been an error in recording the mating dates or a miscalculation in gestation period (period of pregnancy).

How can I tell if the pups are premature?

Truly premature puppies may be small, thin and have little or no hair. Mothers will often reject premature puppies and these puppies soon die of hypothermia (low body temperature). Survival is possible but they require an enormous amount of care and often must be hand fed since they are unable to suckle. Sometimes they must be fed by stomach tube. If necessary, your veterinarian will show you how to do this.

If it is at all possible, ensure that the puppies receive some of the mother's first milk, or colostrum, produced by the bitch 24 to 48 hours after birth, which is rich in antibodies and helps prevent infection in the newborn puppies.

What else should I know about caring for premature puppies?

Excessive heat (hyperthermia) can be just as harmful as hypothermia. Environmental temperature should stay at around 30°C and the box must be large enough so that the puppies can move away from the heat source if necessary.

The puppies must be kept in a humid atmosphere if they are being raised away from the mother. The mother usually licks and cleans the puppies frequently. As a result, not only is the environment warm, but it is also moist. You can provide a moist environment by placing warm, damp cloths in the box beside the pups.

How long will I have to hand raise premature puppies?

If the puppies can suckle, your veterinarian will show you how to hold them on to the mother's teats. If this fails, your veterinarian will advise you on milk replacement formulas and proper puppy bottles. Once the puppies are stronger and able to suckle properly, the mother may resume caring for them.

Although it can be rewarding if the puppies survive, hand-raising puppies is extremely challenging, and many puppies fail to survive.

Are some of the puppies likely to be stillborn or die shortly after birth?

With animals that have multiple births, like dogs, it is not unusual for some of the offspring either to be stillborn or to die shortly after birth. Sometimes a stillborn puppy will disrupt the birthing process, resulting in dystocia or a birthing complication. At other times a dead puppy may be born normally.

Determining the cause of these neonatal deaths is often impossible without a full post-mortem examination. Some causes of neonatal death are preventable. It is important to consult with your veterinarian regarding any problems with your pet's pregnancy or whelping.

I am told that with some breeds caesarean sections are more common than a normal delivery. Is this true?

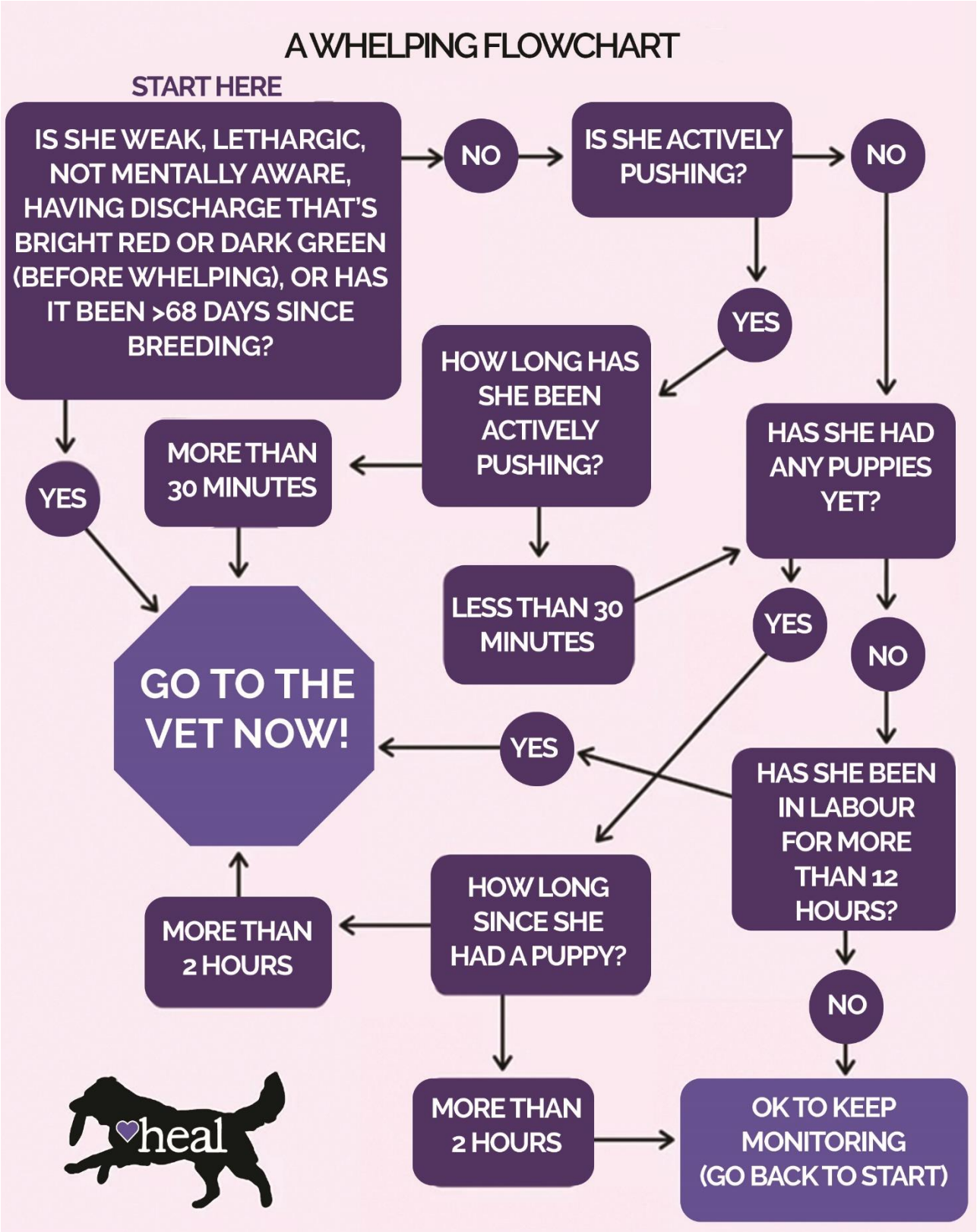
Unfortunately, certain breeds do seem to have increased risk of dystocia (difficult birth) resulting in the need for a caesarean section (c-section)"

Breeds with broad heads or flat faces (brachycephalic breeds) tend to have a higher incidence of birthing problems. The correct timing of a c-section is only possible with the use of progesterone testing at time of breeding to establish actual time of ovulation.

If the bitch is experiencing difficulties, then foetal heart rates are used to determine foetal distress and therefore requirement for caesarean section. If surgery is delayed excessively, it can result in dead puppies and if embarked upon too early, the puppies may be premature.

It is important that you and your veterinarian have a full and frank discussion about the relative benefits and risks of this procedure.

When to call the vet!



Caring for newborn puppies

If the delivery was without incident, what do I have to do to care for the newborn puppies?

For the next two months, even if everything went smoothly with the birth, you have a lot of work to do! After the birthing process, clean up the mother as much as possible without upsetting her. Remove any soiled newspaper or bedding from her whelping box.

Normally the new mother will spend most of her time with the puppies. For the first few days it may be difficult to get her to leave the nest even to toilet. However, it is important that she continue to urinate and defaecate normally. Do not be afraid taking her out for a short period if she refuses to go on her own. She will only want to be out for a few minutes but during that time you can clean up the bed and make the whelping box safe for the puppies.

Before she returns to her puppies, check her nipples and vulva to make sure there are no problems such as bleeding, foul smelling discharge, or any other abnormalities.

What sort of problems am I looking for?

Check the vulva to see if there is much discharge. The discharge is normally a greenish-black color and, if she has not expelled all her afterbirths during birthing, it may be quite copious. However, it should lessen significantly after twenty-four to forty-eight hours. If not, contact your veterinarian.

Check her teats (nipples) to make sure that none are swollen, red, hot, hard, or tender. If you find anything abnormal, call your veterinarian.

Do I have to check the puppies?

It is worthwhile, particularly with a first-time mother, to check the puppies every few hours to make sure they are all suckling and are warm and contented. Any that are crying or appear cold should be placed on the inguinal (hind) teats and checked frequently to make sure they are not pushed away by the other puppies. The teats between the hind legs usually give the most milk.

Is it necessary to have a post-natal veterinary check?

It is important to have the mother and puppies examined by your veterinary clinic within 48 hours of birth. The veterinarian will check the mother to make sure there is no infection and that she is producing sufficient milk.

The puppies will also be examined to make sure that there are no birth defects such as cleft palates. Any necessary medications or injections will be administered during this visit.

What shall I do if the mother refuses to stay with the puppies?

This is common with pets that are closely attached to their owners. If the mother will not stay with her puppies, try relocating her and her family so she can be nearer to you.

Make sure the puppies are kept warm. Remember they cannot maintain their own body heat for a week or two after birth.

As long as the puppies stay close to their mother the room temperature is not too critical. However, if the mother leaves her puppies alone, they need to be provided with a source of warmth. During the first four days of life, the environmental temperature where the puppies are kept should be maintained at 28-32°C. The temperature may then be gradually decreased to approximately 25-26°C by the seventh to tenth day and to about 20-22°C by the end of the fourth week.

It is not necessary to heat the whole room to these temperatures. Heating the area over the whelping box with the aid of a heat lamp is usually all that is necessary.

The larger the litter the lower the environmental temperature needs to be, since the puppies huddle together and keep each other warm.

The puppies' behavior and condition give an indication whether they are comfortable and healthy. If they are warm and content, they will be quiet and gaining weight, otherwise they will be restless and crying.

Should I weigh the puppies regularly?

Yes. Electronic kitchen scales allow accurate and regular weighing of puppies. This gives a guide to their condition and progress.

Is it necessary to keep the mother and puppies in subdued light?

In the wild, dogs will find a secluded whelping place, usually a dark or sheltered spot. Some dogs, if they feel their puppies are too exposed, may become anxious and start carrying them around the house. Placing a blanket over part of the top of the box or providing an enclosed crate may resolve the problem.

Some females are more anxious than others, particularly with their first litter. They may try to hide their puppies, even from the owners. If the mother does not like the place you have selected for her, try to compromise. If she is still unsettled, please contact your veterinarian since stress can affect her milk supply and may cause problems with the pups.

I am told that some female dogs can kill and eat their puppies. Is this true?

In the wild, a dog with puppies is vulnerable to all sorts of predators. If the puppies become vocal and distressed, the danger of attack by a predator increases. The primeval protective instinct will sometimes surface in even the gentlest pet. This occurs in some breeds more than others. Killing the puppies and sometimes eating them is a method of averting a perceived danger.

Since I have not raised a litter before, how can I tell if there is a problem?

During the first two weeks of life, before their eyes open, puppies should feed and sleep for at least 90% of the time. If you are weighing the puppies regularly (once a day), there should be a consistent increase in weight. If any of the puppies appear restless or noisy, this may indicate a lack of nourishment or infection.

Weight loss in a puppy is a cause for concern. Therefore, keep careful records of your newborn puppies' weights. If all the puppies appear similar, you can identify the puppies using non-toxic, permanent marker pens to mark each one on the abdomen (you can use various colors of permanent markers).

If you are concerned about any of the puppies, please consult your veterinarian as soon as possible.

How will I know if the mother's milk supply is adequate?

A contented litter of plump puppies is the best indication that the mother is producing adequate milk. Any puppies that appear restless and do not have fat tummies will benefit from supplemental feeding one to three times a day. Your veterinarian can supply the necessary food and feeders. It is important that any supplementary food be fed at the correct temperature. One rule of thumb is to drop some of the warmed fluid on your arm. It should feel about the same as your normal body temperature.

All the commercial products carry detailed instructions regarding preparation and feeding amounts. Your veterinarian will advise you on supplemental feedings for your specific situation.

I understand that the mother may develop infection or inflammation of the breasts without warning. Is this true?

Inflammation and infection of the breasts is called mastitis and it can occur very quickly. This is the reason that mother's mammary glands should be checked regularly for any abnormal discharge, inflammation, tenderness, or hardness.

If the mother does not produce milk or her milk is infected, the puppies will not be nourished. Puppies that are not being fed enough will cry constantly and fail to gain weight. If this occurs, an entire litter can die within twenty-four to forty-eight hours.

Total replacement feeding either via a foster mother or with milk replacer products is necessary. Please contact your veterinarian for advice.

Is this the same as "milk fever"?

No. Mastitis is an infection of the mammary glands.

Eclampsia or milk fever is due to a depletion of calcium in the blood of the mother due to heavy milk production and is not due to infection.

Eclampsia occurs most commonly when the puppies are three to five weeks of age, and the mother is producing the most milk. Eclampsia is not due to an overall lack of calcium; it merely indicates that she cannot mobilize sufficient supplies of stored calcium quickly enough to meet her metabolic needs. Females that are particularly good mothers, especially attentive to their puppies, seem to be more likely to develop eclampsia. Signs of eclampsia include tremors, weakness and a form of paralysis called *puerperal tetany* characterized by stiff limbs and an inability to stand or walk.

Eclampsia is an emergency and medical attention should be sought immediately.

I understand that milk fever is a very serious condition. How can I tell if it is starting?

Eclampsia is a true medical emergency. Initial signs are subtle. The female may be restless or panting a lot, and you may notice that she is moving stiffly. This soon progresses to muscle spasms affecting the whole body, which can quickly progress to convulsing.

If you suspect eclampsia is developing, prevent the pups from suckling and contact your veterinarian immediately. Treatment involves injections of calcium and other drugs, often intravenously.

If treated quickly, recovery is usually rapid and complete. However, milk fever may occur with each subsequent litter, and should factor into any decision about breeding an affected dog.

One of the most effective ways to prevent milk fever is to switch to a good quality puppy diet once the bitch has whelped. These diets are fortified with calcium and other minerals to support lactation and reduce the risks of milk fever. Over supplementing with calcium and other supplements can increase the risk of developing milk fever.

If you have questions or concerns, please contact the clinic directly for further information.

Caring for mother and puppies after weaning

When will I be able to place the puppies in homes?

You can usually place most puppies in their new homes at around eight to ten weeks of age. Puppies should remain with the litter this long to ensure proper weaning and social development. Puppies that are separated from their mother and littermates too early may have an increased number of behavioral problems.

Should the puppies be treated for worms?

The common intestinal parasites are transmitted to puppies either across the uterus before they are born or through the mother's milk after birth. Puppies can be treated for worms as early as two weeks of age, but it is more common to treat them when they are three and six weeks of age. It is important to weigh the puppies accurately so that the proper dose of medication can be used. Puppies should be treated for worms every two weeks until they are three months of age and then every four weeks until they are six months of age.

What about vaccinations? Should I keep the pups until this has been completed?

Puppies usually receive some protective immunity to the major canine diseases from their mother before and shortly after birth through the first milk or colostrum. This is particularly true if the mother's vaccinations are current, and she is healthy. These maternal antibodies protect puppies against diseases to which the mother is immune during the first few weeks of life. To help ensure that this protection is adequate, you should make certain that the mother receives required inoculations prior to mating.

Maternal antibodies only protect the puppies for a few weeks. After this time, the puppy becomes susceptible to disease. The duration that maternal antibodies last in each puppy is variable and depends on several factors.

First vaccinations typically begin at six to eight weeks of age, depending on individual circumstances. If your puppies were not able to nurse during the first three days of life, they will not have received proper immunity from their mother's colostrum. Similarly, if the mother dog was not up to date on her vaccinations before giving birth, she may not have passed adequate immunity to her babies.

In these situations, your veterinarian may recommend starting their vaccination series earlier, and quarantine procedures may be advisable to lessen the chance of disease transmission to the unprotected puppies. All puppies require two to three sets of booster vaccines as they mature, to develop active immunity against the common infectious diseases. Your veterinary hospital will give you the appropriate vaccine recommendations for your litter of puppies, based on their breed, risk and lifestyle.

What about the mother? Do I have to do anything to dry up her milk supply?

Starting at approximately three weeks after birth, as you start the weaning process, the puppies will gradually feed less and less from the mother's milk. She will be happy to leave the nest for longer and longer periods and, depending on her breed or type, will probably enjoy increased periods of exercise and physical activity.

During this time, her milk supply should be diminishing naturally, and you should start feeding her less. It is rare that medical intervention is required to reduce a mother's milk supply.

Your veterinarian can provide you with this information and give you specific advice that relates to your circumstances. If you have any other questions, please contact your veterinary clinic.

HOW TO APPROACH A FADING PUPPY

Effective puppy management is cntral to successful breeding. Follow these pro-active guidelines if you are faced with a puppy at risk of mortality at the critical neonatal stage (in the first three weeks of age)

PUPPY MANAGEMENT

- Address hypothermia: 35-36°C for the first week, 37-38°C thereafter. Warm hypothermic pups slowly, over a 1-3hr period.
- Monitor normal respiration: 15-40 breaths per minute (low respiration rate risks poor oxygenation and sustained frequent breathing may indicate stress).
- Be aware of low birth weights. While variable (with breed and litter size):
  - Small breed pups should weigh 100-200g.
  - Medium breed puppies 200-300g.
  - Large breed puppies 300-500g at birth
- Ensure healthy weight gain. Weight may drop (~10%) in the first day, but thereafter should increase by 5-10% of birth weight per day. By 8-10 days healthy pups should double their birth weight.

ENVIRONMENTAL MANAGEMENT

- Keep room/ambient temperatures between 25°C and 30°C for the first few days, 22°C-26°C thereafter, ideally at a humidity level below 85-90%.
- High levels of hygeine assist infection control.
- Encourage normal mothering behaviour: create a calm environment facilitating suckling every 1-2 hrs & maternal grooming.

BITCH MANAGEMENT

- Ensure optimal nutrition for the bitch/dam feed a diet appropriate for lactation, according to feeding guidelines (ad lib while puppies are being fed).
- Manage weight in bitches to no greater than 35% above normal/ideal weight at whelping.
- Clip hair about nipples/perineum.

NUTRITIONAL MANAGEMENT

- Support the immune system: 100% dependent on colostrum antibodies. These can now be transferred from natural milk AND by feeding *elect milk replacers.
- Provide adequate energy: 20-26kcal/100g body weight by means of...
  Highly digestable milk & milk replacer ingredients, eg maltodrextrin glucose sources.
- Address dehydration (total 60-180mL/kg/day).
- If puppies don't suckle naturally, feed milk replacer every 2-4 hours.

FEED A MILK REPLACER IF:

- Insufficient milk production (death of dam, low levels of milk, illness).
- Where pups are >25% less than average birth weight.
- For neonates losing >10% weight.
- Where pups don't double birth weight within the first two weeks.

* Be aware pups fed milk replacers may have sub-normal growth rates.
** Do not feed a puppy if it is colder than 35°C. Restore normal temperature first.
*** If necessary/recommended by your vet, consider tube feeding.

HOW TO MEASURE YOUR SUCCESS

Be ready to respond rapidly on recognising a fading puppy and seek veterinary advice where warning signs are present

1) Daily weighing
2) Temperature taking
3) APGAR scoring

		0	1	2
APpearance	(mucus membrane & skin)	Cyanotic	Pale	Pink
Grimace	(reaction to paw pinch)	Absent	Grimace	Vigorous
Activity	(musde strength)	Flacid	Some flexions	Active motion
Respiration	(breaths per minute)	No crying <6 breaths/min	Mild crying 6-15 breaths/min	Crying >15 breaths/min

TOTAL:

Tally your score for each row & classify each puppy's risk:
8 or more = low risk, 4-7 = moderate, 0-3 high risk/intervention needed

*These measures should improve as your puppy grows stronger

Information provided by Royal Canin®

Neonatal Care and Feeding

HYGIENE: KEY POINTS

- **Wash and disinfect your hands** before preparation.
- Regularly sterilise and always wash and rinse bottles and teats before use (with a bottle brush).
- Milk must be served immediately after preparation. Any **leftover milk** must be **discarded within 1 hour**.
- An **open sachet** of formula should be kept for **no more than one month**, preferably in the **refrigerator**.

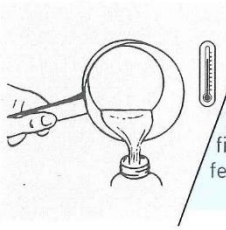
FEEDING & HANDLING: KEY POINTS

- Place the puppy in the prone position A
- **Don't feed hypothermic puppies** (≤ 35°C rectal temperature), rewarm them first
- Don't force the puppy to suckle due to risk of aspiration and pneumonia.
- For an orphaned puppy, stimulate the puppy's perineum with a moist, lukewarm cloth **after every feed** to encourage urination and defaecation during the first three weeks. B
- Weigh and record daily, using a precise scale to ensure normal weight gain.

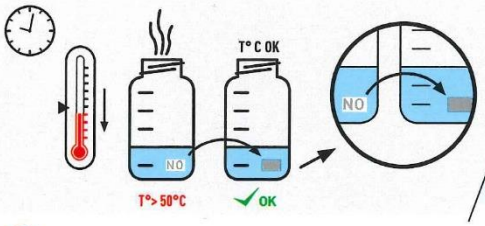
FREQUENCY & QUANTITY

- Allow free consumption. See on-pack feeding guidelines for estimated quantities.
- Respect the puppy's sleeping times.
- Feeding frequency, as per feeding guidelines:
  1st **week: 8 meals/day**
  2nd **week: 5 meals/day**
  3rd **week to weaning: 4 meals/day**
  (when 5 weeks old, stop using feeding bottle and serve on a plate/shallow bowl)

PREPARATION

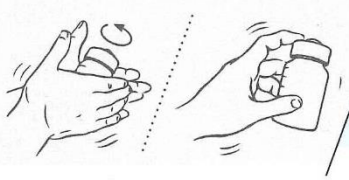


1. Pour the required quantity - 40 ml minimum - of boiled, low-mineral filtered water into the feeding bottle provided.

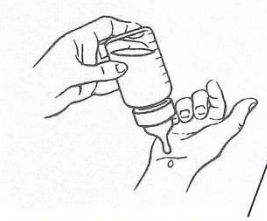


2. **Wait until the NO disappears, meaning the water is now < 50°C, before adding the powder.**

3. Add 1 level spoonful (10 ml) of powder per 20ml of water.



4. Close and shake the feeding bottle.



5. Be sure to cool the milk (to approximately 35°C), checking temperature on your wrist before feeding.

WARNING: Do not use a microwave oven to heat this product!

*** See in-pack detailed user guide*

Feeding Orphaned Puppies

New-born puppies are relatively immature at birth compared to many other mammals, and large breed puppies are less mature than small breed puppies. The period of time they spend being nursed by their mother (bitch) helps the new-born puppy transition from *in utero* nutrition to solid food.

When puppies are raised on their mother's milk, their growth and health is influenced by:

- the nutrition of the mother during pregnancy and early lactation
- the mother's overall physical health and behaviour
- good neonatal care

The first few days of a mother's milk is known as colostrum. Colostrum is very high in protein and transfers important immune system elements. Whenever possible, new-born puppies should receive their mother's milk as it sets the stage for normal immune system function and protection from disease.

If the mother is incapable of raising her puppies herself, the puppies are considered orphans and some important needs must be met to ensure their survival: appropriate heat, humidity, nutrition, elimination, sanitation, and social stimulation.

Fortunately, most orphaned puppies can be raised successfully with a bit of care and attention to detail. Using a logbook to track their development is a good place to start.

What should I track in a logbook?

Maintaining a logbook about the orphaned puppies doesn't need to be complicated. The intent is to simply keep track of how they are doing so you can identify if there are any potential concerns with their development.
Tracking their weights, milestones and routines are key, so be sure to record details of when their eyes open, when their teeth begin to erupt, their food intake, stool consistency, etc.

TIP: Individual puppies must be identified in some way, so consider coloured collars or nail polish on a few front toenails.

How often should puppies be weighed, and how much should they weigh?

The birth weight of each puppy should be recorded every day or two for the first four weeks of life. Starting in their fifth week, you can switch to weekly weigh-ins. A digital kitchen scale works best for these measurements.

Puppies should gain about 5% of their current body weight per day during the first four weeks. This means that body weight may double eight to ten days after birth and triple by the third week of life.

What do orphaned puppies need for proper nutrition?

Water is a critical nutrient for orphaned puppies, just as it is for all other stages of their life. Normal water intake is relatively high for puppies, needing 130 – 220 ml of fluid per kg of body weight each day.

On average, the total fluid volume fed per day (including milk replacers) should be approximately 180ml/kg of puppy body weight. Mother's milk is highly digestible and very calorie dense. Compared to cow's milk, milk from a puppy's mother contains more than twice as much protein, which helps to explain why cow's milk is not ideal for feeding orphaned puppies.

Commercial puppy milk replacers are recommended as they are superior to cow's milk and home-made mixtures. The milk replacer you choose should meet several key nutritional factors. For every 100g of milk replacer fed (on a dry matter basis), there should be:

- 33g protein
- 42g fat
- 14.5g lactose

How do I feed orphaned puppies?

Most puppies will suckle on small pet nurser bottles, also known as pet nursers. When bottle fed, puppies will nurse until they are full and then reject the bottle.

Be sure the opening in the nipple restricts the outflow of fluid to one drop at a time to avoid a flow rate that is too rapid for the puppy. When the flow rate is too rapid, it can lead to aspiration, pneumonia, and/or death.

When feeding, hold the puppy in a horizontal, head-neutral position. If the puppy is too weak to suckle, your veterinary team can show you alternative feeding methods and assist in tube feeding if needed.

TIP: Handling puppies during feeding contributes to critical socialisation

How much and how often should I feed orphaned puppies?

Orphaned puppies should be fed on a strict schedule, preferably every two to four hours. Puppies up to two weeks old can generally consume their daily intake in four to five meals per day. Small breed puppies should be limited to 10 to 15ml per feeding during the first week of life to prevent diarrhoea.

Commercial milk replacers are labelled to help you calculate the total volume to be fed per day. To calculate the amount for each feeding:

- Dilute the total daily volume of milk replacer to a final volume of about 180ml/kg of puppy body weight
- Divide that total into the desired number of meals per day.

It is recommended that you warm puppy milk replacer to approximately 38° C before feeding but be careful not to overheat it. Cold formula, overly rapid feeding rates, and overfeeding can lead to regurgitation, aspiration, bloating, and diarrhoea.

If the orphaned puppy develops diarrhoea, reduce the formula volume. It is better to slightly underfeed than to overfeed neonatal orphaned puppies. Puppy milk replacer should be the sole source of nutrition until three to four weeks of age at which time the weaning process may begin.

The transition from formula to solid food is a gradual process, so be patient. Use a high-quality food formulated to support growth and reproduction. Introduce small amounts of semi-solid or solid food to supplement formula, and transition to solid food by five to six weeks of age.

What's my role in helping a puppy to eliminate?

Puppies cannot eliminate (urinate or defaecate) on their own until about 3 weeks of age. They rely on their mother to stimulate their reflex to initiate elimination. Orphaned puppies, on the other hand, rely on their caretakers to stimulate them to eliminate.

After feeding, you can stimulate their reflex to eliminate by gently stroking the area between the anus and vulva or penis with a warm, moistened cotton ball or soft cloth. Your veterinarian can help you learn this technique.

What are some best practices for proper puppy hygiene?

Orphaned puppies require you to pay strict attention to their hygiene for optimal health and development. Follow these best practices for proper puppy hygiene:

- Bottles and nipples should be cleaned and then boiled in water to sterilize them between uses.
- Never prepare more milk replacer than can be used within 24 hours and always keep it refrigerated.
- Discard formula after 1 hour if left at room temperature.
- Once or twice each week, gently wash the puppies with a moist cloth.

By paying attention to the details of feeding and hygiene, you can help orphaned puppies thrive.