

A BREEDERS GUIDE TO CANINE REPRODUCTION



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INTRODUCTION

Before embarking on the experience of producing and raising a litter of puppies you need to make a few important decisions .

Firstly , be honest as to the motivation for why you are having a litter . In most instances there are only a limited number of reasons for having a litter. Namely , you are trying to produce a show dog for the betterment of the breed and to allow you to exhibit in conformation classes . Alternatively you could be aiming for financial gain . This is not a negative reason as financial gain is the reason for most livestock to be produced . Another reason could be maintaining a bloodline that links previously owned dogs that you feel affection towards .

Determining why you want to produce a litter is important as it will motivate your decisions regarding this litter . If betterment of the breed is truly your motivation then it will be imperative that you critically assess your brood bitch and prospective sires . You may need to seek the advice of a more experienced breeder or exhibitor in your breed , especially if you are only a novice with limited experience in the breed . Wherever possible try to see any progeny the stud dog has sired and any of his relatives . Occasionally there will be a fantastic show dog but he may not produce puppies that reflect his excellence . Try to do your research , especially with any health issues . The result you do not want is a surprise that could be catastrophic. If available, have your brood bitch checked for any genetically linked diseases – this can usually be done with a simple DNA test collected from a cheek swab. Clear by parentage means that both parents of the puppies have tested clear and because of the mode of inheritance all the puppies cannot be affected . In some breeds it is advisable to have radiographs of both parents hips and elbows for assessment and scoring .

Consumers are becoming more demanding and litigious. Therefore, wherever possible you should use tests and tools available to ensure that puppies produced have no genetic abnormalities . Some diseases can severely affect the health of puppies and in extreme cases can result in death or disablement at a very early age .

Secondly , consider what you will do if you have surplus puppies . What will you do if you cannot find homes for all the puppies in the litter ? What will you do if a puppy or dog is returned to you. This could be for any number of reasons – such as circumstances of the new owner changing and they can no longer keep a dog ? Are you financially prepared if a puppy you have produced develops a disease that would be hereditary and therefore make you liable ?

Finally , are you prepared for the possibility of the pregnancy , whelping or raising of the puppies not going smoothly ? There is always the potential for things to go wrong . Are you prepared to lose your brood bitch ? Are you prepared for the cost of an after hours caesarian ? Before starting the process you need to be prepared for the possible complications so that decisions are not made under stress and without much consideration . Talking to your veterinarian and/or a more experienced breeder is always recommended .

FEMALE REPRODUCTIVE ANATOMY

Female dogs are mammals and therefore give birth to live young that require suckling from the dam to provide initial nutrition . Female dogs are called bitches . Bitches are litter bearing – meaning they are able to produce more than a single foetus per pregnancy. The bitch uterus is Y-shaped (see diagram below) and generally the foetuses are distributed evenly between the two horns of the uterus . Sometimes all the foetuses are only in one horn , though this is usually due to the foetuses in that other horn becoming non-viable during the pregnancy .

DIAGRAM OF FEMALE REPRODUCTIVE ANATOMY

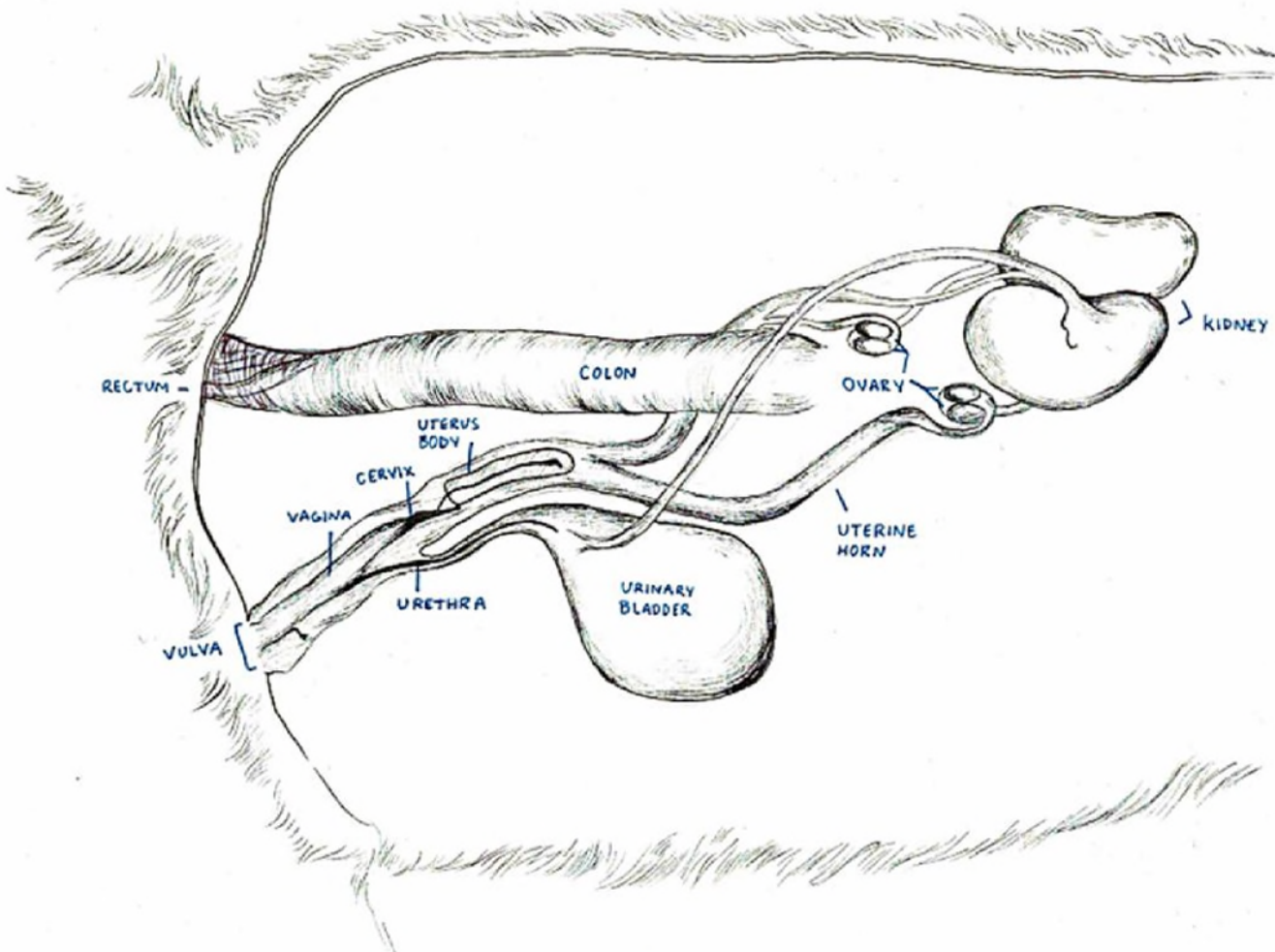
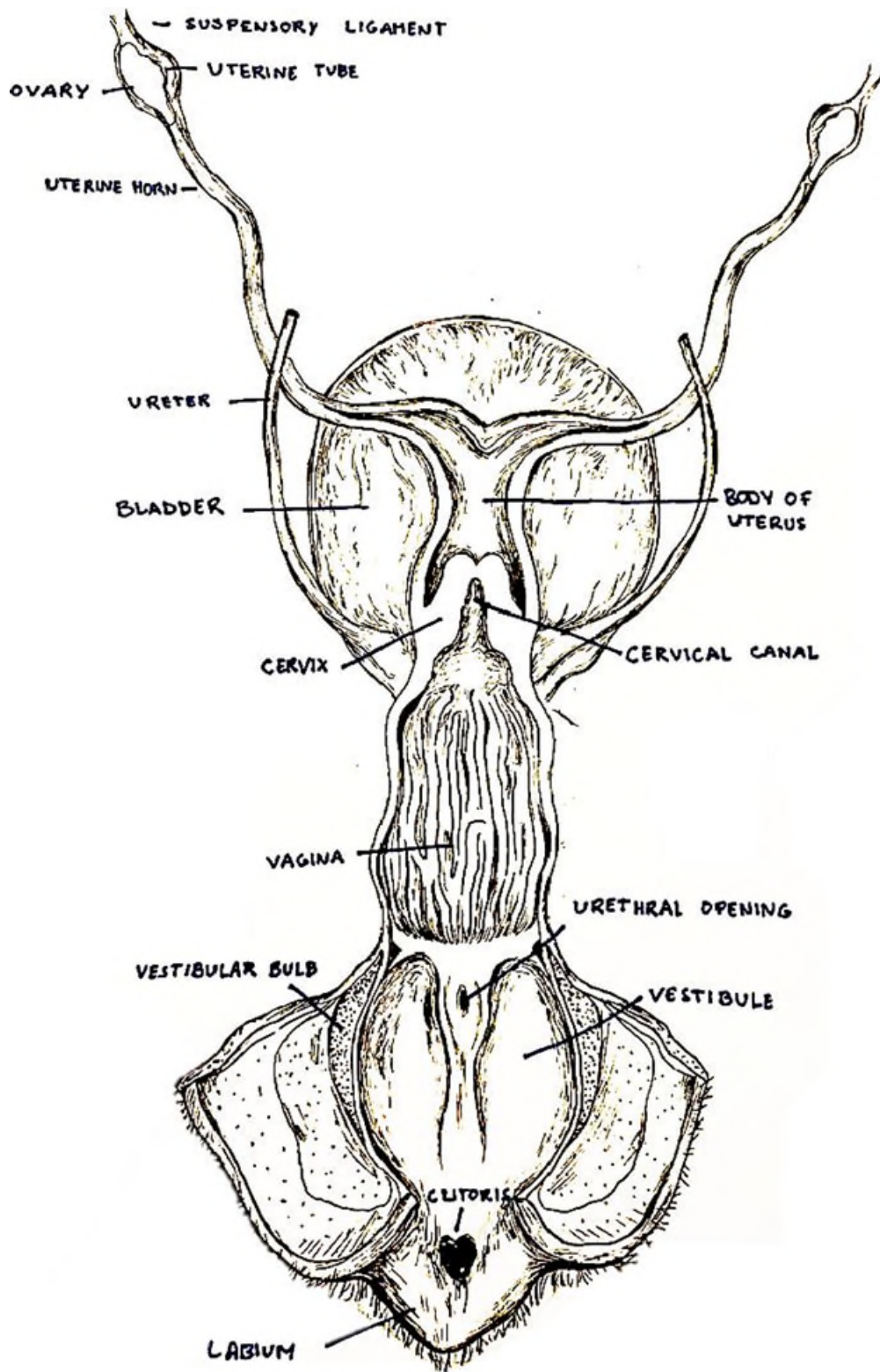


DIAGRAM OF FEMALE REPRODUCTIVE ANATOMY : TOP DOWN VIEW



FEMALE REPRODUCTIVE CYCLES

The fertile period for the bitch is called the oestrous cycle or being "on-heat" or, "in-season". This is the only time that a bitch is fertile and usually the only time she is receptive to the male. The oestrous cycle is divided into 3 stages based on the changes of the cells lining the vagina or of specific hormone levels .

The 3 stages of the oestrous cycle are –

Pro-oestrus

Vaginal cytology – nucleated cells show large nuclei ; large numbers of red blood cells (erythrocytes) & White blood cells (leucocytes) with variable numbers of bacteria
Serum progesterone less than 16 mmol/L or . Vulva is firmly swollen and discharge is bloody .

Oestrus

Vaginal cytology – few or no nucleated cells , no white blood cells , few red blood cells or bacteria .
Progesterone greater than 16 mmol / L – shedding of the eggs from the ovaries occurs during this stage between progesterone level of 16 – 32 mmol / L .
This is the stage of the oestrous cycle when the bitch will display observable signs of receptivity such as standing and moving tail to side , " flagging", when touched around the vulva area - mating usually occurs during this stage . Vulval swelling has softened and discharge is straw coloured .

Dioestrus

Vaginal cytology – Return of nucleated cells , white cells and red blood cells . Progesterone is usually at least 60 or more . Vulval discharge returns to bloody . Dioestrus ends when the bitch gives birth.

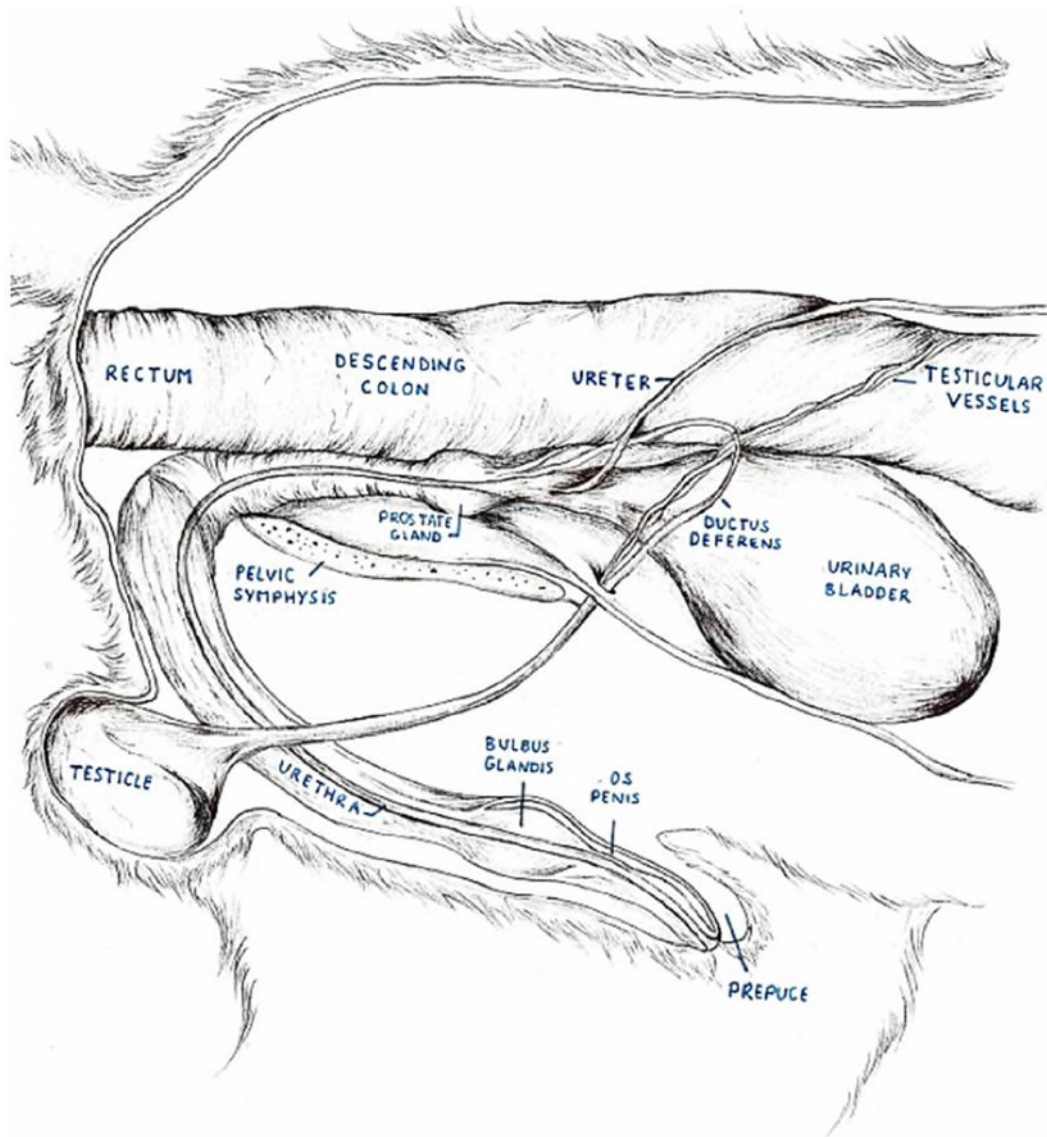
Following Dioestrus , when the bitch's progesterone level returns to zero or 1 ,the bitch is considered to be in Anoestrous . This is the time period between oestrous cycles – it varies from 3 months to 12 months with an average of 6 months. As a rule the smaller the breed the shorter the interseasonal period. The time between the first and second seasons is usually the length of that bitch's interseasonal period and will remain consistent as long as she cycles . Irregularity of this period can be an indication of underlying problems that can affect fertility .

After ovulation the bitch will be under the influence of progesterone , the "pregnancy " hormone . The area of the ovary where the egg is released from develops into what is called the corpora lutea. The corpora lutea produces the progesterone which is released into the bloodstream and this maintains the pregnancy . If the progesterone level decreases below 6 then the foetuses will either resorb if before 4 weeks of pregnancy or abort if greater than 6 weeks of pregnancy . The progesterone is produced regardless of whether the bitch is mated or not . Different bitches have different sensitivities to the effects of progesterone and therefore some bitches will appear to be pregnant even if they are not pregnant – this is called pseudo pregnancy or phantom pregnancy . Some bitches will even produce milk and attempt to mother inanimate objects such as soft toys or tennis balls . Interestingly a bitch that has overt pseudopregnancies will not always be a good mother – some would much rather have their soft toys to mother than real puppies .

MALE REPRODUCTIVE ANATOMY

The male canine is unique in that they have a bone in their penis called the os penis . The urethra passes through the os penis and the os penis is surrounded by the vascular part of the penis . It is the engorgement of the vascular penis that produces the erection that allows the penetration of the vulva during mating , At the caudal end of the penis is another unique anatomical structure – the bulb of the penis which allows the “tie” during mating . Once the shaft of the penis penetrates the vulva and reaches the vagina the bulb of the penis swells and produces the lock that keeps the male and female tied . During the “tie” , which can last from a few minutes to 45 minutes , the male initially expresses the sperm-rich ejaculate followed by the accessory gland secretions . The accessory gland the Prostate produces this fluid.

DIAGRAM OF MALE REPRODUCTIVE ANATOMY



MATING = THE COPULATORY PROCESS

The Copulatory process is unique in canines as it is a tied mating during which the male and female are locked together by the bulb of the penis . During this tie the male secretes sperm and accessory fluid into the vagina of the female. The tie itself has two functions: Firstly the female can be mated by multiple sires during her oestrus stage . By secreting accessory fluid after his semen the male is providing more fluid to allow the sperm to reach the uterine tubes (also known as the fallopian tubes or oviduct) where fertilisation occurs and also acts as a physical barrier to any other semen that subsequent matings may introduce . The tie also allows the male to swing his leg over the female so that the joined dogs are better able to defend themselves by standing tail to tail .

During the period of the tie the female will develop vaginal contractions in response to the expansion caused by the bulb of the penis which helps to move the sperm closer to the Fallopian tubes . As the female will remain receptive even after mating there is a potential for more than one male to be the sire of a litter . Sperm can survive up to 5 days in the female reproductive tract which further enhances the likelihood of multiple sires.

After the eggs are shed by the ovary they undergo a process called maturation before allowing penetration of the sperm . The sperm also undergo a process called capacitation to allow them to penetrate the egg . Both these processes occur in the Fallopian tubes as does fertilisation of the egg by the sperm .

After fertilisation the fertilized eggs (oocysts) float around in the uterus before attaching to the lining of the uterus called the endometrium . Placental attachments anchor the developing foetus to the uterine lining in the uterine horns as pregnancy commences .

TIMING OF MATING

Timing of mating is very important to ensure a successful pregnancy . Traditionally breeders would mate the bitch on days 10 and 12 of the oestrous cycle based on vulval swelling and haemorrhagic discharge . This was relatively successful particularly if you had an experienced stud dog that would be able to pick the correct time . However it could be inaccurate for a variety of reasons such as many male dogs will mate a female dog regardless if she is or isn't receptive.

Additionally, receptivity of the bitch is not an accurate determinant of ovulation . Some bitches will allow mating from mid-pro-oestrus to dioestrus . Lastly , mating is not always a good indicator of due date for whelping as sperm can survive for several days within the female reproductive tract so fertilisation can occur days after mating. It is important to know when the bitch has ovulated as this allows the date of whelping to be accurately predicted .

Vaginal cytology

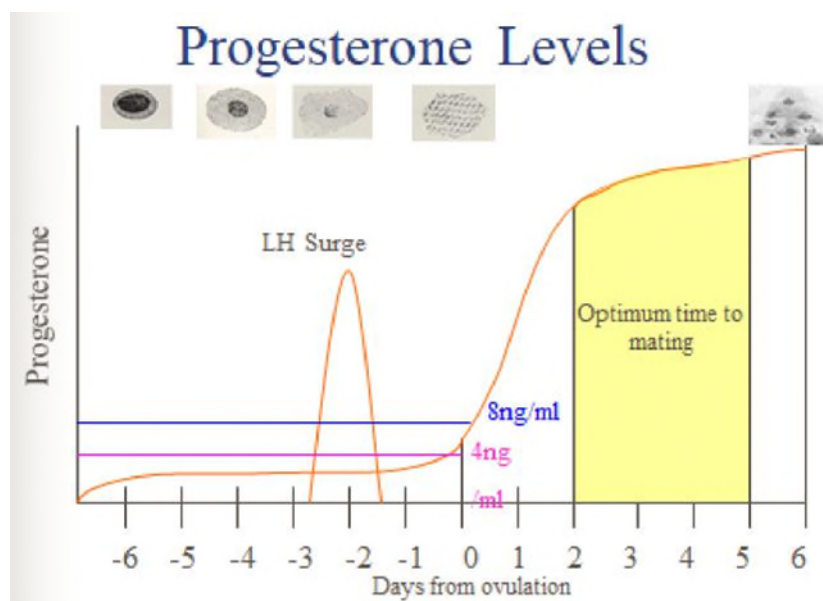
The first clinically assisted method in timing of mating is monitoring vaginal cytology by routine vaginal swabs allowing greater accuracy in determining the time of mating. This involved regular swabbing of the vagina to determine the cells present and therefore the stage of the oestrous cycle. This improved the accuracy of the correct date of ovulation and hence whelping date but could also have inaccuracies based on the skill and experience of the veterinarian assessing the cytology and how closely the cytology correlated with the actual time of ovulation. In recent decades these methods have been replaced with progesterone assays whereby the level of progesterone in the blood is correlated with other hormonal changes that occur prior to and around the time of ovulation. The development of serum progesterone measurements has greatly enhanced the ability to accurately determine if and when the bitch has ovulated.

Progesterone

Progesterone correlates directly to when the bitch will ovulate and release her eggs during her oestrous cycle. Progesterone assays involve taking a blood sample from the bitch and submitting it to an external laboratory or using an internal machine to measure the level of progesterone in the blood. How often samples are taken will depend on: How accurate the owner would like the timing of ovulation, how easy it is to sample the bitch, the financial constraints of the owner and how quickly the samples reach a level indicating ovulation. Some bitches can ovulate as early as Day 5, whilst others can be Day 18 or later.

There are 2 different measurements for progesterone level depending on which external laboratory is used and what measurement in-house machines are calibrated to. These are ng/ml or nmol/L. Depending on which is used, the timing of mating is usually around 4-5 ng/ml or 16-32 nmol/L for natural mating or using fresh semen artificial insemination. If performing surgical artificial insemination or transcervical insemination, especially if using frozen semen, the progesterone level is usually higher as the semen is being delivered closer to the Fallopian tubes where fertilisation will occur.

DIAGRAM OF PROGESTERONE LEVELS AND VAGINAL CYTOLOGY DURING OESTRUS



Briefly, natural mating is still considered the most successful method provided the timing is correct. However, studies have shown that placement of semen directly into the uterus will improve whelping rate and litter size for any semen type of assisted vaginal insemination.

Semen Preparation & Analysis

Fresh, chilled, or frozen semen can be used for artificial insemination. Semen is collected from male dogs using a collection vessel and manual stimulation. Collected sperm or a recent collection from the dog should be analyzed before mating to ensure it is suitable. The semen may then be stored via chilling or freezing if needed based on the insemination method being used.

Semen Analysis

Semen analysis consists of a sperm count to determine sperm concentration, motility analysis to determine sperm viability, and morphology analysis to identify sperm abnormalities. Overall this will determine the semen quality and suitability for use in different insemination methods.

Fresh semen

Fresh semen has a short life span without preservatives or an energy source. Fresh semen can be immediately used by artificial insemination methods if the female has already undergone ovulation timing.

Chilled Semen

This method would be used when the distance between the male and female is prohibitive. It involves collecting from the male and adding to the semen a product known as an extender that protects the semen and provides energy to the sperm whilst the sample is transported to the female after being chilled. Using chilled semen involves careful planning and timing as the sperm will be only viable for a limited time and should be shipped overnight or as soon as possible, ideally within 24 hours. As such, testing to determine ovulation timing in the bitch must be conducted before the semen is shipped.

Frozen Semen

Frozen semen is initially prepared in the same way as chilled semen with extenders that also prevent damage to the sperm during the freezing procedure. It is prepared and stored in either straws or pelleted form and kept at -20°C until needed and must be used immediately after being thawed. Frozen sperm have decreased viability and must be placed directly into the uterus. Therefore, it is recommended frozen semen should be used with transcervical insemination using an intrauterine endoscope or by surgical insemination.

Artificial Insemination

Artificial insemination will involve one of three techniques: traditional Vaginal or Intra-Uterine catheter insemination, Surgical insemination or Transcervical insemination. TCi and Surgical are the preferred methods when using frozen semen . It is important to remember that any of these methods of insemination have the potential to transfer infection to the bitch thereby affecting her current and future fertility and general health . Wherever possible any form of insemination should be conducted under the highest levels of hygiene to minimize these risks.

Artificial Catheter Insemination

Typically done using fresh semen (but chilled can be used) this is known as the "side by side" technique. This involves collecting from the male and delivering the semen directly to the vaginal vault using some form of uterine catheter and is done without visualizing the uterus or cervix .If skilled the person performing the procedure may be able to use the "scandinavian method" which involves passing the catheter into the cervix to deposit the semen directly into the uterus. This is very dependent on the skill and experience of the person performing the procedure; for example, ensuring the bladder or urethra are not accidentally catheterised in the process (see diagram for uterine). It is important to note most veterinarians offering this service will be using vaginal insemination methods not the scandinavian method, so it is important to discuss with your veterinarian which they offer.

Surgical Artificial insemination

Delivers the semen sample as close as possible to the Fallopian tubes . It necessitates the female to undergo general anaesthesia and have an abdominal incision to exteriorize the uterus for direct insemination. This method potentially carries the most risk to the bitch and in the UK and other countries is now prohibited due to the invasive nature .

Transcervical insemination

Involves the use of an endoscope tube to pass through the cervix into the uterus . Allowing direct examination of the uterine lining and delivery of the semen close to the point of fertilisation . Depending on the skill of the veterinarian this technique rivals natural mating in it's success rates and has the advantage of being able to confirm changes in the uterine lining that are associated with ovulation and identify any potential issues that may reduce success .

INFERTILITY

If you have attempted to breed your bitch and a successful outcome of a healthy litter has not resulted then before attempting again you should consider the following . Did a pregnancy result and did that pregnancy continue to term.

The first thing to consider is that infertility could involve either the female or the male , or , as in most cases , the timing of mating was not correct .

If not successful at the very least consider progesterone assays to accurately predict ovulation and hence , time of mating and date of whelping. Also artificial insemination would be recommended so that the sperm can be examined prior to placing in the bitch so as to assure the semen is viable . This would be followed by ultrasound examination at 3-4 weeks post mating / insemination to determine if the bitch does become pregnant . If the bitch does not become pregnant then there is more likely to be an issue with the female than the male. However you may want to consider using a different male for subsequent attempts as there may be an issue with the genetics that results in non-viable foetuses.

The bitch should undergo a complete health check by your veterinarian , including total health blood profiles with Thyroid hormone levels measured. This is to rule out underlying health issues that may be affecting her fertility. The use of vaginal swabs for culture and sensitivity to detect bacterial infection is controversial . These swabs only sample the vagina as the cervix is usually closed and therefore do not indicate what is happening in the uterus so their value may be limited .

Greater information can be obtained by endoscope examination during the oestrous cycle when the uterine lining can be directly visualised . Another consideration would be abdominal ultrasound concentrating on the reproductive tract , though this needs to be done by a skilled ultrasonographer with experience in the canine reproductive tract and can be difficult in very small bitches .

If pregnancy is detected 3-4 weeks post mating and subsequently results in no puppies or much reduced numbers then the problem is with the female . A cause for this is the bitch not maintaining adequate progesterone levels throughout the pregnancy resulting in resorption or death . This is termed Hypo-oestrogenism . Death of foetuses can result in resorption , expulsion or mummification . This can be diagnosed by checking progesterone levels once pregnancy is confirmed . This is usually done weekly in a bitch where indicated and if noted progesterone levels are declining rapidly then progesterone supplementation is commenced . It is recommended that regular uterine ultrasounds are conducted to monitor foetal heartbeats as progesterone supplementation will cause a bitch to retain dead foetuses which could result in infection and death of the bitch.

A final comment would be that not only are breed characteristics inheritable . Many other traits such as mothering of puppies , ease of whelping , litter size and temperament are also highly inheritable and should always be considered when making the decision to breed from your bitch . If , as part of your breeding plans , you select for self-whelping good mothers with excellent temperaments , you will find greater success as a breeder than breeding from bitches with a maternal history of difficult births and poor mothering .

THE PREGNANT BITCH

Pregnancy is called Gestation Period in veterinary medicine . Whelping is called parturition . In the canine, pregnancy varies from 61 – 64 days if measured accurately from the time of ovulation.

Prior to mating the bitch should be in good body condition and be up to date with vaccinations , heartworm prevention and parasite control – both internal and external . The healthier your bitch the better are your chances of a successful outcome. Ensure you have complied with all relevant DogsNSW regulations regarding the breeding of bitches prior to mating your bitch . Also make sure you have made plans regarding where you are whelping your litter and raising your litter . There are NSW Government regulations regarding the minimum standards of housing and care that must be adhered to under the Department of Primary Industry that you should familiarise yourself with.

Recommendations are to increase food intake by 10% per week for the last 3 weeks of pregnancy so that the bitch will be eating approx. 30% extra by the time of whelping . Some bitches may develop a lack of appetite early in the pregnancy and /or late in the pregnancy for varying reasons . If they develop early inappetence it is usually due to hormones , if severe contact your veterinarian . Inappetence late in pregnancy is usually due to reduced space from enlarging uterus or discomfort from active foetuses . Vomiting is not normal late in pregnancy and should be monitored and if persistent checked by a veterinarian . Markedly increased thirst would be another cause for concern and requires checking by a veterinarian. During pregnancy the bitch should be treated as normally as possible . During pregnancy Bitches should be wormed around 5-6 weeks. Avoid excessive exercise or environmental temperature. Also avoid any forms of medication . Some bitches who have had previous issues with infection are sometimes prescribed antibiotics mid-pregnancy but this should only be done under the guidance of a veterinarian .

Pregnancy Diagnosis

Confirmation of pregnancy by ultrasound examination can be achieved from 3 weeks gestation but is usually more accurate at 4 weeks . Foetal skeletons can be identified on radiography at 6 weeks gestation , counting puppies is usually best at 7- 8 weeks .

ULTRASOUND OF 3 FOETAL SACS AT 3-4 WEEKS GESTATION



PREPARATION FOR PARTURITION

Prior to pregnancy you should have already determined where you are going to whelp the litter and raise your puppies . You should have timed the pregnancy so as to be optimum for your circumstances . Some breeders prefer summer litters whilst others prefer winter . Puppies are usually not rehomed until 8-10 weeks of age and the first 2 weeks are usually the most critical so don't plan an overseas holiday around the time you will be raising puppies .

Where To Whelp ?

It is a good option to be able to control environmental temperature with air-conditioning or heaters in winter. A rule of thumb is that the room should be warm enough for you to be wearing a T-shirt in comfort , approximately 24 - 25 degrees Celsius. The area selected should be in a quiet area of your home with subdued lighting and the number of people present should be limited to 2 people - yourself plus your breeder mentor or a calm person that the bitch is familiar with . Do not have the male present - the bitch can become very protective and will attack the male . Sometimes they will even be aggressive to their owner . The less stress in the whelping area the better as the bitch can suspend parturition if she feels threatened .

The actual whelping box can be made from a plethora of materials and difference in expense. Whelping boxes should be approximately large enough for the bitch to lay on her side but not so large as to allow a great distance between puppies and the bitch so as not to take advantage of the dam's body heat . Factors to consider when selecting a whelping box should include the ability to warm puppies and ease of keeping clean . Many different options are available commercially . It is advisable that the inner aspect contains a rail or similar to allow puppies to be adjacent to the walls of the whelping box without being squashed by the bitch . Some breeders will choose underfloor heating via heat pads , others choose overhead heating with lamps . There needs to be an area where the bitch can move so as to allow her to cool herself . A good idea is to have half the whelping box heated and the other half left unheated so the bitch can cool down if necessary . There are options regarding the bedding in the whelping box . Some breeders choose disposable materials such as newspapers or shredded paper , others choose washable materials such as Vetbed or blankets / towels . Whatever is used should be able to maintain a clean environment for the bitch and the puppies . Also once the puppies start to be more mobile it is important that the bedding provides some "grip" or traction for the puppies so that they are less likely to become "swimmers" , a condition seen when puppies become overweight and unable to use their limbs properly

Whelping medical kit

Another pre organised essential is to have a whelping medical kit ready . The majority of the time the bitch does the whelping naturally without human intervention but sometimes she needs human help and it is best to be prepared . This kit would contain : scissors for cutting cords or breaking membranes ; string or wool to tie off cords ; disposable gloves to prevent your hands being stained by foetal fluids; scales to weigh puppies ; notebook to record times when puppies whelped , their gender & some form of identification ; small towels or face clothes to dry puppies and provide traction if need to help puppy out of vulva ; a charged mobile phone in case you need to call your veterinarian or more experienced breeder; and some form of liquid calcium to supplement the bitch .

Stages of Labour

Knowing the normal stages and signs of labour progression is important prior to [delivery](#). so that you can monitor your bitch and determine if it is progressing normally or if you need to seek veterinary help

Stage 1

Stage 1 is typically the longest. In this stage the cervix will dilate and the bitch will typically show nesting behaviour. Other common behaviours will include hiding away or isolating themselves as well as panting or even vomiting.

Stage II

Stage II involves the start of contractions and the active delivery of the puppies; and as such, the rupture of the first placental membrane. This is equivalent to the bitches "waters breaking" and small volume of clear to blood-tinged fluid is passed prior to delivering first puppy. The first puppy should be delivered within 4 hours. but bitches with constant active contractions can be expected to pass the first puppy within 30 minutes. Time between each pup should ideally be no more than 1 hour as chances of puppy death increase after this time ; if you approach 2 hours you need to seek veterinary help.

Stage III

This involves the passing of placentas . This normally occurs after each pup and within 15 minutes of their birth. Your bitch will normally eat these very quickly and as such confirming they have passed may be difficult. Stage II and stage III will alternate until she has given birth to the whole litter. Sometimes the bitch will have two or three puppies and then pass several of the placentas together.

PARTURITION

The behaviour of bitches during whelping varies greatly and the following is just a guide and should not be seen as the normal for all whelpings. Wherever possible it would be advisable to have observed a whelping . particularly of your breed , under the supervision of a more experienced breeder . If possible it would be a good idea to have this breeder attend your whelping if you have never whelped a bitch before . If this cannot be achieved then YouTube can be accessed with videos of bitches whelping to familiarize yourself with the process.

Usually a guide to when to expect parturition to commence is 63 days post mating . This is highly variable and even when determined by measuring progesterone levels can still be affected by factors such as the size of the foetuses , the number of puppies , the individual bitch's usual length of pregnancy etc . External factors can also affect when a bitch will whelp – some prefer whelping at night for example. If the bitch is very stressed she may delay or start whelping earlier than expected

If progesterone assays were measured to determine the time of ovulation then the date of parturition would be 63 days from ovulation + / - 2 days . If unsure of the date of parturition then taking the bitch's rectal temperature morning and night in the week leading up to the possible due date can be helpful . Often the bitch's temperature will decrease by a Celsius degree or more in the 32 hours prior to giving birth . It will then start to increase again as uterine muscular contractions produce heat . Other signs that parturition is imminent include passing of the mucoidy cervical plug from the vulva – this can happen up to 5 days before . The area around the anus and vulva will appear softer than previous under the influence of the hormone Prolactin . The bitch can become restless and find it difficult to lay down . She may start nesting behaviour where she will frantically start shredding her bedding – some bitches start this 24 hours before whelping . She may stop eating or even vomit as contractions strengthen . Foetal movements which were previously able to be detected will decrease or cease . The bitch may start panting excessively as the process continues . Contractions can vary from hardly being noted to vocalization and whole body stretching . The majority of bitches tend to pant , hold their breath whilst they contract , then start panting again. They will often stretch out their back legs as they contract and the contractions will have shorter + / - shorter intervals between them as the whelping progresses .

The puppy should normally come through the birth canal head first with the forelimbs first and the head between the forelimbs in a diving position . Any difference in positioning can result in increased difficulty in the smooth passage of the puppy . Once the puppy reaches the pelvic area of the uterus , which usually results in the head of the puppy being in the vulva then the puppy should be presented within minutes . Delay can result in foetal death if the puppy is retained within its foetal sac as it will be unable to breath. Careful monitoring at this stage is vital – if the puppy is not coming away quickly you may have to intervene and apply steady pressure to help the puppy be delivered - grip the puppy with a face cloth or gloved hand if preferred , and as bitch contracts gently pull the puppy to help pull it out . Sometimes this will take 2 or 3 contractions before success . If you are needing to apply excessive force without delivering the puppy then the puppy may be “stuck” and may need veterinary intervention. If unsure, contact your veterinarian or a more experienced breeder . Do not delay in seeking guidance as the other puppies will be compromised if unable to be promptly delivered and commence breathing . There is a potential for foetal death of the stuck puppy and any remaining puppies .

The foetal membranes can be ruptured as the puppy is delivered or the puppy can be delivered within intact membranes which the bitch will chew through to release the puppy and allow it to start spontaneous breathing . On occasion first time bitches will not tear the foetal sacs and the breeder may have to do this and then rub the puppy with a towel to dry the puppy and stimulate breathing – often once the puppy vocalizes the bitch understands and will then start to lick the puppy and chew the umbilical cord . If the bitch does not chew the cord the breeder may have to tie the cord approx. 2 – 3 cm from the puppy's abdomen and cut the cord . Depending on the number of puppies in the litter and the breeder's personal preference the bitch usually eats the placentas and foetal membranes to provide herself with nutrition and not to attract predators . This is not as important in domesticated dogs and sometimes this can result in the bitch vomiting which can be very unpleasant . Monitor how short and how vigorous the bitch chews the cords – too short can result in haemorrhage and too vigorous can cause umbilical hernias .

Usually the time between puppies being delivered decreases as the whelping progresses . A guide would be 2 hours between puppy 1 & 2 , then 1.5 hours between 2 & 3 , one hour between 3 & 4 and so on . If the bitch at any time is strongly contracting , with contractions seeming to be continuous , and a puppy is not produced within 5 – 10 minutes , then this is a cause for concern and veterinary advice should be sought without delay . Often bitches will rest during the process and provided she seems comfortable and not contracting then no cause for concern unless this rest exceeds 2 hours .

As the puppies are born they should be weighed, a system of identification, including gender should be created and each puppy checked for any abnormalities such as cleft palates , hare-lips or dewclaws on hindlimbs. A good healthy puppy should double its birth weight within the first seven days. Cleft palate describes a condition whereby the roof of the mouth does not form properly and a defect is created that prevents the puppy from creating the vacuum necessary to allow suckling . The puppy will not thrive and can easily succumb to aspiration pneumonia . Hare lips are created when the upper lips under the nose do not merge, leaving a defect that may involve the nose as well . If a puppy has either of these defects the breeder should consider euthanising the affected puppy as repair of these defects often takes multiple surgical procedures . Consultation with your veterinarian to confirm the defect and discuss options would be recommended. If having dewclaws on hindlimbs is not part of your breed standard , Pyrenean Mountain dogs for example are meant to have rear dewclaws , you may want to have these removed within 3 - 5 days after birth as at this time it is a simple snip as there is only skin usually holding these claws onto the limb. This is usually best performed by a veterinarian or experienced breeder .

PROBLEMS OF PARTURITION

Signs and reasons that you may need to contact your vet for assistance during labour include: Failure to start labour on the due date. However, if the bitch is bright and alert and there is no vaginal discharge and the pups are moving then it is safe to wait. Failure to progress in normal labour Strong and frequent straining that fails to produce a puppy within 20 minutes. Weak or intermittent straining that fails to produce a pup within 1-2 hours (between pups) . A greenish-blackish discharge appears without the arrival of a puppy within 1 hour; as this indicates the placenta has separated. Partial delivery of a puppy or if a puppy becomes stuck in the vulva

Dystocia

Dystocia refers to if the bitch is having unusually long or difficult labour . Depending on the causes treatment may include medical or surgical management such as a cesarean section . Dystocia can occur due to problems arising from the bitch or the pups . Both of these may present as a bitch with no visible contractions or one that appears not “to be pushing” . Maternal factors include: primary or secondary uterine inertia, small pelvic size or vaginal stricture. Primary inertia is when there are no active uterine contractions and can happen at any stage but is more common early in delivery. While secondary inertia is due to the fatigue of the uterine muscles and calcium stores after repeated unsuccessful contractions . Because of this, secondary inertia is usually secondary to an obstructive dystocia where something is causing the pups to become stuck. Puppies can cause dystocia from being oversize or have abnormal presentation or posture i.e. sideways or head bent back. Bitches with strong contractions for 30 minutes or more without producing a puppy should have a digital vaginal exam to assess for secondary obstructive dystocia. At the veterinary hospital, abdominal radiographs can be used to determine puppy number, approximate size, and presentation relative to the birth canal.

Medical management of dystocia

Depending on the cause of dystocia surgical intervention may not be needed and puppies may be able to be delivered vaginally with some help to the bitch. Your veterinarian may provide you with some of these options/ medications to try at home after contacting them for advice. However bitches with 2 or more pups left to deliver are likely to have a better outcome if caesarean is chosen first over medical management

Calcium injections can be given to improve the strength of uterine contractions . As calcium is used to produce active muscle contractions a bitch's stores of it can become easily depleted after a long period of contractions or delivery of a large litter. Calcium is most readily absorbed if given as a calcium injection once labour and contractions have started . However, oral calcium given at this time is also thought to improve the bitches usable calcium stores, albeit at a slower rate.

Oxytocin injections can be given to the bitch to increase the frequency of her contractions. This only works however if the bitch has already entered labour and has stopped contracting after successful contractions. For this reason it is advised you do not give an oxytocin injection unless your bitch has already partially delivered the litter and now seems to have stopped. If oxytocin is given at the start of labour it can cause uterine spasms which can effectively suffocate the puppies. If given when there is an obstructive cause of dystocia oxytocin can cause uterine rupture. As such a maximum of 2-3 doses should be given to the bitch and if no progress is made and calcium is normal a caesarean section is likely required.

Caesarian section

A caesarian section may be the better option for delivery in certain cases vs natural birth or medical management of dystocia . Some of the situations that this may apply are : If the puppies are in distress - this may be indicated by greenish-blackish discharge that appears without any puppies , indicating the placenta has separated. Low puppy heart rate or movement which can be assessed by your veterinarian on ultrasound . Puppies with a heart rates <180 bpm should be considered in distress with normal puppy heart rates being over 200 bpm. Another reason for a caesarian would be a dystocia that cannot be medically managed further. Cesareans are not always an emergency procedure however, and are quite often the result of careful planning . In some situations they may even be suggested over a natural birth . This may include a singleton pup where the initiation of labor is unlikely, anatomical features that may make natural birth difficult or dangerous such as vaginal stricture, small bitch size or high risk breeds such as brachycephalic bull faced breeds. Additionally if a bitch has had dystocia with past litters and required a caesarean for delivery it is likely that this will be the case with subsequent litters.

The goal of a cesarean section is to progress the delivery of the puppies as rapidly as possible while minimising total anesthetic time. You can help this by preparing your bitch by clipping her abdomen in the days prior to her due date. Most cesareans take anywhere from 1-3 hours depending on the size of the bitch and litter as well as the state of the uterus ie infection or resorbing puppies. While it may seem convenient to get a bitch spayed at the time of cesarean, it is not recommended unless absolutely necessary due to increased surgery time and higher risks of blood loss and resulting complications. Approximately 1/3rd of a bitches circulating blood volume is held in the uterus during late pregnancy.

Most veterinarians will not place the puppies on the bitch to feed in hospital due to a high risk of her rejecting or injuring the puppies. It is important to note that puppies are born with specialised stores of brown fat that they use as an energy source after being born so feeding as soon as possible is not necessary.

When you come to collect the bitch and the pups make sure you bring a crate or basket, large washing or storage tubs can be ideal. It will need to have several warm blankets as well as a heat source such as a hotwater bottle or heat pack to keep the pups warm, as they are very susceptible to getting cold. Additionally, make sure you have somewhere separate to transport your bitch whether that be a crate or tethering in the back of the vehicle while the puppies ride next to you on the front seat or footwell.

When taking the bitch home we strongly suggest you DO NOT place the bitch in or with access to the puppies even if under direct supervision i.e. on the back seat. This is because the anaesthetic can take several hours to fully clear from her system and anaesthetics can affect each dog differently each time. Many bitches will accidentally hurt or kill puppies at this time. This may even be unintentional from over zealous moving or grooming of the puppies while in a stressful environment such as a car ride

As such, we recommend the bitch is first introduced to the pups once she is relaxed and settled at home and the first feeding can be closely supervised by several people. If you think your bitch may show aggression or is a terrier or hunting breed, it is a good idea to muzzle her or have another person hold her head for the first feed to ensure no accidents happen upon introduction.

Appropriate pain relief after the surgery is very important as anecdotally bitches with good postoperative pain control appear to mother their neonates more readily so be sure to give any medication your vet prescribed and monitor the bitch for signs of pain or discomfort.

Milk fever (Eclampsia)

This results from a dangerous drop in blood calcium levels, when the bitch is unable to keep up with the demands of making milk. Because of this it is most commonly seen in smaller breeds, and or bitches with large litters. Milk fever usually occurs in weeks 2-4 of post whelping, but it can occur at any time while she is still producing milk. To prevent it, an oral calcium supplement may be given to the bitch after the pups are born . Symptoms include muscle spasms, restlessness, panting and twitching that can rapidly progress to seizures. Please consult your veterinarian as soon as possible if you suspect milk fever as treatment is required immediately and can be fatal if left untreated .

Mastitis

Can be caused by an infectious or non infectious inflammation in the breast tissue. This can occur at any stage but is more common at weaning or in low litter numbers where not all the teats are being suckled. Symptoms to look out for include:red or hot glands ; bloody, or pus like discharge from the nipples and in extreme cases , burst abscesses. She may seem unwell with a temperature and off her food or can seem normal in some cases. Although she will be sore it is important for the bitch to continue nursing as keeping the puppies on helps to reduce swelling and promote clearing of the infected material. While most cases are simply treated by a course of antibiotics. If you suspect your bitch has developed mastitis you should contact your veterinarian as soon as possible as early intervention can reduce the severity and duration of the disease .

Metritis (Inflamed Uterus)

Metritis is an infection in the uterus and can occur at any time after giving birth. It may be caused by a retained placenta or trauma during birth. Some blood-tinged discharge is normal after giving birth for 3-5 weeks. However, if this discharge is excessive or smelly it may indicate metritis. If the bitch is unwell it may also indicate metritis.Excessive bleeding may indicate retained puppies or uterine rupture – these are not common complications but are all very serious. Signs will normally be evident soon after or as the bitch is giving birth. If the bitch is unwell, the discharge is overly bloody, has an odor, or looks like pus, or she still appears to have undelivered puppies inside her . Your bitch should be examined by your veterinarian as soon as possible.

Agalactia (No milk production)

Causes can either be from the bitch not yet producing milk or not “letting it down” . If your bitch had milk before the birth of the puppies then the problem is not production of the milk but letting it down. Bitches will often hold milk if stressed during whelping. If your bitch fails to produce any signs of milk prior or after the birth of the puppies then lack of milk production may be the issue . Commonly for either concern, your veterinarian may give medications to help reduce her stress and or encourage milk production. Colostrum from the bitch can only be absorbed in the gut of the puppies in the first 24-48 hrs. This provides them not only with essential nutrients but also antibodies from the mother to help build up their immune system. As such, you should contact your veterinarian as soon as possible if you suspect your bitch is not producing milk.

POSTPARTUM CARE

Here are the steps you should know for postpartum care, nutrition, and nursing. Your bitch should be kept on a higher calorie (pregnancy or puppy) diet for as long as she is lactating (nursing her puppies). Make sure she has food and fresh water readily available at all times. Keep the mother dog and her puppies in a clean, quiet, low-traffic area of the house. If there is too much commotion around her, she may become stressed and neglect her puppies. Newborn puppies should be nursing every one to two hours, so your dog will likely be with them constantly for the first week or two. If you think that your dog may not be producing milk, or isn't letting the puppies nurse, contact your veterinarian right away.

Medications and vaccines should be avoided while your dog is lactating (nursing) if possible.

At least once, preferably twice a day the puppies weights should be measured and recorded. It is better to monitor increases in bodyweight as percentages rather than absolutes. Puppies often decrease in bodyweight in the first 24 hours due to drying out from the fluid environment of the uterus and then should increase daily resulting in a doubling of birthweight in the first week.

The bitch will stimulate the puppies to toilet by licking around their genital areas. During the first 2 weeks she will do this frequently and keep the whelping area clean. As time progresses the puppies increase the amount of excreta and the breeder will need to increase the cleaning of the whelping box as a consequence. The bitch and puppies are totally dependent on the breeder to clean their environment - it is a responsibility that needs to be taken seriously and diligently. The goal is to have the puppies growing at the same rate so that you end up with an "even" litter where all the puppies are approximately the same weight without significantly larger or smaller puppies. If a puppy seems not to be gaining weight at the same rate as littermates the breeder should opt to have the puppy checked for any health issues by either a veterinarian or a more experienced breeder. Sometimes a puppy will require supplementary feeding to gain weight - advice should be sought from a veterinarian or experienced breeder as to the best choice of product and method.

Introduction of solid foods - weaning - usually starts at around 3 weeks of age. This may start earlier if the puppies are not gaining weight or the bitch's milk production is declining. Puppies should be fully weaned by 6 - 8 weeks as they are usually rehomed between 9 - 10 weeks. Parasite treatment - worming - usually starts at 3 - 4 weeks. The main endoparasites are Roundworms and Hookworms. Roundworms come from latent infections in the dam's muscles that cross the placenta so the puppies are born with infections that the bitch re-infects herself with when she cleans up after the puppies. Hookworms come from the dam's milk. Puppies should be wormed every 2 weeks until they are 12 weeks of age and then monthly until 6 months of age.

Puppies should have received their initial vaccination and have been microchipped prior to adoption by their new owners. A responsible breeder will provide a puppy pack which should provide the owner with a feeding guide and a program of parasite control. New puppy owners are usually enthusiastic to receive information and therefore the breeder is the best source. Breeders should have familiarised with the relevant legislature from the NSW Government regarding Guidelines for Breeding Dogs and relevant rules and regulations from DogsNSW. Microchip details on NSW Pet Register should be changed into the new owners name within 2 - 3 weeks. It is sometimes prudent to delay changing all information into the new owner's name as sometimes unforeseen circumstances necessitate the puppy being returned and it can be complicated to change the details again.