

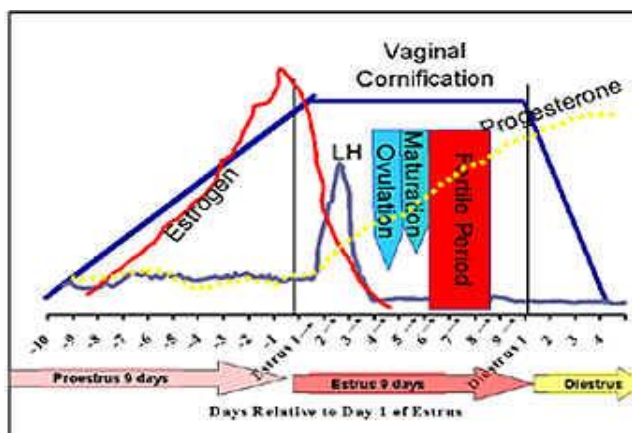
TIPS FOR BREEDING TO ACHIEVE PREGNANCY AND OPTIMAL LITTER SIZE

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Estrous cycle (heat cycle) of the bitch

1. How often bitches have estrous cycles is determined by:
 - a. Breed of dog
 - b. Size of dog: small breeds can cycle 3 times/year while giant breeds can cycle once per year
 - c. Young bitches can cycle irregularly, and become more regular after age 2 yrs
 - d. Health and age of the bitch
 - e. There is no season of the year that corresponds to estrous cycles
2. Anatomy: follicles are sacs in the ovaries that each contain an immature egg
 - a. Ovaries of bitches contain thousands of follicles at birth (a lifetime limited number), which decrease as the bitch ages and after each ovulation.
 - b. A similar number of eggs are produced with the ovulation of each estrous cycle
 - c. As each follicle and its egg develop, it causes gradual increase in estrogen
3. Stage 1: Proestrus = preparing for mating, lasts about 9 days
 - a. Pituitary gland in the brain releases follicular stimulating hormone (FSH) that stimulates maturation of the follicles in preparation for ovulation
 - b. Estrogen is released from follicles → peaks 2-3 days prior to proestrus
 - Prepares reproductive tract for breeding
 - Causes a scent that encourages attraction of male to the bitch
 - Causes vulvar swelling and vaginal discharge
4. Stage 2: Estrus = time to breed, lasts about 9 days
 - a. Release of luteinizing hormone (LH) from the pituitary gland causes a surge of LH that triggers ovulation
 - LH causes thinning of follicles that then rupture
 - Eggs are then released from follicles into the fallopian tubes
 - Flaggings begins
 - Progesterone begins to rise
 - b. 2 days after LH surge numerous immature eggs (ova) are released from the follicles **over a 24-hour period** (ovulation)
 - c. Release of eggs from follicles causes a further, rapid rise in progesterone
 - d. Eggs released require 2-3 days to mature enough to allow fertilization with sperm, which occurs in the tubes of the ovaries (fallopian tubes, AKA oviducts)
 - e. The eggs are then moved into the uterus for implantation
5. Stage 3: Diestrus = either a pregnancy or no pregnancy period, lasts about 60 days
 - a. Time of progesterone dominance
 - Stimulates secretion of nutrients to puppies prior to implantation
 - Stimulates mammary development
 - b. Fertilized eggs move into the uterus 8-9 days after ovulation
 - c. Placentas start to develop at about 14 days after ovulation
 - d. Fertilized eggs implant into the uterine wall 16-18 days after ovulation
6. Stage 4: Anestrus = uterus is preparing for the next pregnancy, lasts 2-8 months
 - a. Period of reproductive inactivity



Tracking heat cycles

1. Note the number of months between heat cycles to predict her next season to help you plan for her next mating. Bitches tend to keep regular cycles, except after having a litter (1-2 months late) or exposure to another bitch in season (1-2 months early). Familial history may play a role in cycle length and intervals.

Record date of the beginning of each heat cycle. **Note: See breeding chart at end of article.**

2. **Bitches tend to ovulate on same day with each heat cycle**, variations exist. You need to find the actual beginning of the heat cycle by using a consistent method for accuracy.
3. If you detect the exact first day of her heat cycle, you will know which day she ovulates during her heat cycle. Once progesterone testing determines ovulation day, and if you are vigilant with detecting the beginning of her heat cycle, you may be able to determine ovulation day for her next heat cycle. If successful, you will not need to spend money again on blood tests for ovulation timing. If you miss the first day of her next heat cycle, you will need again to get progesterone levels for ovulation timing.
4. Determine the first day of bitch's heat cycle by:
 - a. Being aware of when she is due to come in season
 - b. Checking her at least daily for a month prior to her next suspected heat cycle date
 - c. Observing swelling of vulva that usually precedes color changes in vaginal drainage
 - d. Watching for more frequent urination and cleaning/licking her vulva often
 - e. Noticing interest by males
 - f. Finding color (tan or light pink) on a Q-tip when inserted into vagina about 1/2 inch for small dogs and at least an inch for medium dogs = first day of heat cycle. Note: If the Q-tip shows red or you observe red drainage, you missed the first day

Determine ovulation day to achieve pregnancy

1. Most bitches ovulate on day 10-12 of their heat cycle, but many variations exist.
2. Obtain a progesterone level blood test on about day 4-6 after finding color in vaginal drainage, continuing every 2-3 days until the results reflect ovulation completed (>5.0).

<u>Progesterone values</u>	<u>US values ng/ml</u>	<u>Canadian values nmol</u>
• < 1.0 = anestrus or proestrus (early)		3
• 1.0-1.9 = should ovulate in 3 days		6
• 1.25-1.5 = rises faster after this level		
• 2.0-2.9 = should ovulate in 2 days (LH surge)		8-12
• 3.0-3.9 = should ovulate in 1 day		12
• 4.0-4.9 = ovulation is beginning		12-24
• 5.0-6.0 = eggs have been released		> 24
• 4.0-10.0 = ovulation day, ovulation occurs over about a 24-hour period		

- 8.00-12.00 eggs are mature (ripe), can be fertilized for about 2 days
 - Cornified vaginal cytology at >10.0 = ovulation plus 1-5 days
 - Non-cornified vaginal swab at >10.0 = missed breeding time
 - Rise of 3-4 in a 24-hour period after a level of 4.0 = confirmation of ovulation
 - 12.0-30.0 = peak fertilization time which is 2-3 days after ovulation when eggs are ripe/mature, and the cervix may be open or relaxed to allow sperm to cross into the uterus to reach the eggs. Note, post ovulation values vary greatly between bitches.
 - >20 is optimal for frozen or fresh chilled sperm implantation
 - 40.0 = near end of first trimester (3 weeks) of pregnancy
 - 150.0 = at term, drops quickly once whelping begins
 - <10.0 at 3rd trimester (6-8 weeks) = abnormal pregnancy
3. Ovulation failure can occur if progesterone does not rise to > 5.0-8.0
 - Serial progesterone tests must be done to determine a trend
 - Consider that a rise in progesterone to > 3.0 does not predict that the bitch will ovulate or when she will ovulate – some bitches can stall (plateau) for 1-3 days, which may indicate an ovarian cyst, or may not ovulate
 - **Obtain serial progesterone tests to assure the value is > 5.0 prior to choosing breeding dates!**
 4. The LH surge (correlates to progesterone of 2.0-2.9) is a trigger for ovulation, another blood test that can be done. Ovulation begins 2-3 days after LH surge. However, LH surge is short lived (24-48 hours) so can be missed. LH surge can occur without ovulation due to a fertility issue, evidenced by a rise in progesterone followed by a drop.
 5. Bitches **start active labor 9 weeks (63 days) from ovulation day, ± 2 days.** Knowing her ovulation day allows you to schedule time to be available for whelping. Keep in mind that the early stage of labor (nervous, nesting) may last 8-24 hours prior to the beginning of active labor (pushing).
 6. Some breeders indicate their bitch is due to whelp a certain # of days after the last breeding. **NOT TRUE!** Some stud dogs will breed them too early or too late. **The key is to pinpoint the day of ovulation, not when she is bred!** This also facilitates planning a c-section date.
 7. Bitches tend to ovulate on the same day of each heat cycle, but up to 40% variations exist. If you did not do progesterone levels to determine ovulation day prior to a pregnancy, count back 9 weeks from the day that active labor began. This will give you ovulation day, ± 1 day for the next time you breed her. Again, you must know the exact first day of her heat cycle for this prediction! Recommendations by veterinarians is to perform ovulation timing when planning a breeding.

Pinpoint ideal breeding time to achieve pregnancy and optimal litter size

1. After ovulation is completed, the bitch's eggs live for 4-6 days. 2-3 days is required for eggs to be mature enough to accept sperm (ripeness). The eggs remain fertile for another 2-3 days.
 - a. Eggs are ripe 2-3 days after ovulation is completed (progesterone 8-12)
 - b. Eggs are ripe all day of day 4 after ovulation is completed
 - c. Eggs are in the process of dying on day 5 after ovulation is completed
2. Fertile period, prime time to breed = progesterone 12.0-30.0, 2-4 days after ovulation, 4-6 days post LH surge
 - Typically, after ovulation the vaginal drainage changes from red to a straw color, the bitch flags the male, and he is interested. However, these signs are not reliable for accurate ovulation timing.
3. Consider the quality and life span of sperm, plus its effects on the uterus when breeding

- Fresh ejaculation with a tie at time eggs are ready to be fertilized is optimal. Live sperm (natural breeding or side-by-side AI) live 4-6 days.
- Frozen sperm after surgical intra-uterine or TCI (trans cervical insemination, inserted into the uterus) deposition live 12-18 hours.
- Fresh chilled sperm after insemination live 1-3 days, depending on extender used that protects sperm from toxins & bacteria, and provides nutrients & cooling buffers. Optimal goal for fresh frozen: deposit by TCI and total from all shipments should be >500 million healthy, active sperm
- Semen evaluation minimums for frozen sperm: 10 million/pound of body weight, >75% motility (affected by temperature changes), >80% normal shape, vigorous (steady, forward progression)
- Regarding TCI or AI, be aware that:
 - No data exists that TCI or AI three times is significantly better than breeding twice
 - Semen in excess after multiple inseminations can cause uterine inflammation
 - Cases exist in literature of bitches that developed extensive uterine inflammation after multiple inseminations resulting in no pregnancy
 - The take-away is time 2 inseminations well correlated with progesterone levels

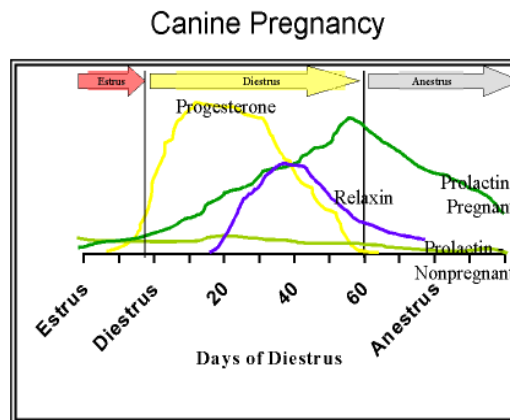
Promote optimal health to achieve the largest litter size and to assure the bitch can withstand pregnancy, whelping, lactation, and raising puppies

1. Provide a well-balanced diet and access to clean water
2. Provide supplements: fish oil for brain health, probiotics for gut microbiome and immunity, folic acid (to prevent midline birth defects – cleft palate, spina bifida, open abdominal wall)
3. Promote exercise
4. Assure no parasites: obtain tick borne diseases blood test (heartworm, lyme, etc) at least 1 month prior to breeding to allow time in case antibiotics are needed, and a fecal test for worms
5. Test dam and sire for brucellosis (sexually transmitted disease that can affect fertility and pregnancy)
6. Test for thyroid function (low thyroid causes issues with fertility, pregnancy, puppies)
7. Obtain veterinary wellness blood panel to detect hidden organ diseases (kidneys, liver, pancreas, diabetes, digestive, etc.)
8. Keep the genital areas clean of debris and hair to prevent infections
9. Consider vaginal culture early in season in case an infection without symptoms is present that may require antibiotics
10. Assure that sire is healthy and will provide active and abundant sperm
 - Each bitch produces a certain number of eggs to be fertilized that determines size of litter. Quality and quantity of sperm determines how many eggs get fertilized.

Methods to diagnose pregnancy

1. Palpation by a veterinarian at 4-5 weeks after ovulation -- accuracy reported at 88%
2. Ultrasound can be done at 25 days after ovulation with 94-98% accuracy
 - a. Optimal time is at 4-4.5 weeks after most significant breeding (progesterone > 5.0), indicating day that pregnancy started; optional time is 3.5 weeks after ovulation
 - If < 4 weeks of age pups may be too small to visualize
 - If > 4.5 weeks of age pups may be large enough to hide other puppies, causing an inaccurate count

- b. May be useful at 5-6 weeks after ovulation when timing is too late for palpation and too early for xray
- 3. Xray can be done at 6 weeks after ovulation, but preferably in the final week of pregnancy when puppy bones are fully mineralized (more visible on xray). Xray is 100% accurate for pregnancy, and very accurate at determining litter size and position of puppies. If fetal teeth are seen via xray, whelping is predicted in 3-8 days.
- 4. Hormone assays (see chart below):
 - a. Relaxin (hormone released from the fetal/placental units) is specific for pregnancy. Is most accurate at 4 weeks, and peaks at 6-7 weeks after ovulation.
 - b. Prolactin (hormone that stimulates and sustains lactation) is specific for pregnancy when it rises 4 weeks after ovulation (mid gestation), but tests may not be available



The whelping window: predicting when puppies will arrive

1. Definition of whelping window:
 - a. 62- 64 days after progesterone reaches > 5.0 (ovulation day)
 - b. 64-66 days after LH surge
2. Predictions are inaccurate if based on breeding dates
3. Runt pups are same age as other pups but placenta formation may have been inadequate.
 - a. All eggs are released over 24 hour time period, are fertilized at almost the same time, and float free for 17 days until uterine implantation and formation of the placentas.
4. How litter size can impact early onset labor versus overdue labor
 - a. Canine placentas only last so long and begin to deteriorate rapidly at the end of the whelping window. Overdue bitches may need C-section.
 - b. Very large litters are likely to arrive early or at beginning of whelping window
 - c. Small litters are likely to arrive near the end of the whelping window
5. Signs that whelping will be within a week:
 - a. Nesting begins
 - b. Rectal temperature done 3-4 times per day remains >99 degrees
6. Signs that whelping will be within a day (Stage 1 labor):
 - a. Progesterone drop to 1.0-2.0 = will whelp in 18-30 hours
 - b. May last from 6-12 hours or up to 24 hours
 - c. Temperature drops at least 1 degree, to < 99 degrees = labor will start in 8-24 hours
 - d. Mild contractions that are not visible while cervix opens gradually
 - e. Restless, nesting more vigorously
 - f. May refuse food or vomit
 - g. Shivering, panting, pacing
 - h. Clear, mucoid vaginal discharge
7. Signs of Stage 2 labor

- a. Visible abdominal contractions to expel puppies
 - b. Presentation of 1-2 round golf ball-sized sacs of tan or pale green water may precede puppy or may rupture before puppies arrive (may be the uterus horn sac, helps lubricate birth canal)
 - c. Puppies are whelped
8. Stage 3 labor involves delivery of any placentas that did not arrive with the puppies
- a. Keep track of numbers – retained placentas can cause uterine infection
 - b. Dogs instinctively eat placentas to keep den clean in the wild, thus preventing predators. Do not allow the bitch to eat placentas – they do not contain needed nutrition or hormones and often cause diarrhea if ingested.

Vickie Halstead RN has been actively involved in breeding and showing Bichons Frises since 1990 and Portuguese Water Dogs since 2017, producing 36 litters and >50 AKC champions, one of which achieved Best in Show at the 2005 Bichon national specialty. She has been a member of the Bichon Frise Club of America (BFCA) since 1997, a member of BFCA's Health Committee since 2001 & chairwoman 2003-2010, plus was a member of the Board of Directors of BFCA 2005-2007. She published articles in the Bichon Frise Reporter, dog magazines, newspapers, and on www.bichonhealth.org. She is a member of the Portuguese Water Dog Club of America (PWDCA) and its health committee since 2018. Vickie has been practicing as a Registered Nurse since 1973, retired in 2017 after previous experience in ICU (adult & pediatric), flight nursing (helicopters & fixed-wing aircraft), ER for 25 years, legal nurse consultant, speaker for nursing classes/seminars, and lastly as a Coumadin (blood thinner) Nurse at a clinic. Currently she operates a healing service primarily for dogs, but also humans, that offers energy healing (reiki, healing touch) and aromatherapy <https://www.victoireshealingandbreeding.com>.

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BREEDING AND PREGNANCY CHART

SIRE _____ DAM _____

WHELPING DATE	NUMBER OF PUPPIES	SEX OF PUPPIES	
	DATE	RESULTS	COMMENTS
1st Day of Season = pink vaginal discharge. Later red → tan, flagging, males interested			
Progesterone #1			
Progesterone #2			
Progesterone #3			
Progesterone #4			
Vaginal Cytology			
Breeding #1: Tie AI/TCI Frozen Fresh chilled			
Breeding #2: Tie AI/TCI Frozen Fresh chilled?			
Breeding #3: Tie AI/TCI Frozen Fresh chilled			
Ultrasound			
Xray			
Decreased Appetite, vomiting			
Mucous Vaginal Discharge			
Temperature			
Temperature			
Temperature			
Temperature			
Temperature			
Temperature			
Whelping Day Status of Pups			

