

Summary Position Statement on Gonad Sparing Sterilization Procedures

(such as ovary sparing surgery (OSS), tubal ligation, vasectomy, chemical castration) versus traditional spay/neuter where both gonads are removed:

The American College of Theriogenologists (ACT) and the Society for Theriogenology (SFT) believe that the decision to sterilize a pet, the method used, and the age at which the procedure is performed should be made on a case by case basis, and that this decision should be made between the pet's owner and veterinarian, taking into consideration the pet's age, breed, sex, health status, intended use, household environment, and temperament. Companion animals not intended for breeding may benefit from sterilization in efforts to avoid production of unintended litters and life-threatening conditions such as pyometra.

There are risks and benefits to both gonad sparing sterilization and traditional spay/neuter. The evidence available at this time is not definitive, so recommendations on type of sterilization procedure should be conservative until there is a clearer understanding of the mechanisms behind altered cancer rates, increased longevity and other purported risks or benefits of the gonads.

Owners of intact pets, either non-sterilized or sterilized with a gonad sparing procedure, must be responsible for preventing unwanted breedings, and must be aware of the signs of gonad-related illnesses, such as pyometra, mammary cancer, and prostatic hyperplasia. In certain countries, like the US, where intact companion animals are less common, this will require an adjustment in thinking on the part of both the pet owners and the veterinary community. All the risks and benefits of gonad sparing procedures should be thoroughly discussed with owners prior to decision making.

Basis for the American College of Theriogenologists and Society for Theriogenology Position Statement regarding Gonad Sparing Sterilization Procedures:

Summary Position Statement on Gonad Sparing Sterilization Procedures

(such as ovary sparing surgery (OSS), tubal ligation, vasectomy, chemical castration) versus traditional spay/neuter where both gonads are removed:

The American College of Theriogenologists (ACT) and the Society for Theriogenology (SFT) believe that the decision to sterilize a pet, the method used, and the age at which the procedure is performed should be made on a case by case basis, and that this decision should be made between the pet's owner and veterinarian, taking into consideration the pet's age, breed, sex, health status, intended use, household environment, and temperament. Companion animals not intended for breeding may benefit from sterilization in efforts to avoid production of unintended litters and life-threatening conditions such as pyometra.

There are risks and benefits to both gonad sparing sterilization and traditional spay/neuter. The evidence available at this time is not definitive, so recommendations on type of sterilization procedure should be conservative until there is a clearer understanding of the mechanisms behind altered cancer rates, increased longevity and other purported risks or benefits of the gonads.

Owners of intact pets, either non-sterilized or sterilized with a gonad sparing procedure, must be responsible for preventing unwanted breedings, and must be aware of the signs of gonad-related illnesses, such as pyometra, mammary cancer, and prostatic hyperplasia. In certain countries, like the US, where intact companion animals are less common, this will require an adjustment in thinking on the part of both the pet owners and the veterinary community. All the risks and benefits of gonad sparing procedures should be thoroughly discussed with owners prior to decision making.

Alternative methods of sterilization such as ovary sparing surgery (OSS), tubal ligation, vasectomy and chemical castration have been gaining popularity in the United States over the last few years because of new research indicating that maintaining gonadal steroid production may increase longevity¹⁻¹⁰, decrease the incidence of certain neoplasms (osteosarcoma^{1,10-13}, hemangiosarcoma^{1,10,13-16}, lymphoma^{10,14,21}, transitional cell carcinoma^{1,10,22,23}, mast cell tumor^{1,10,13,24}), decrease the incidence of certain diseases such as urinary incontinence^{1,13,25-27}, musculoskeletal disease (hip dysplasia^{1,13,14,16,28}, cranial cruciate rupture^{1,13,14,16,28-30}, autoimmune diseases^{13,31}, obesity^{1,32}) and may reduce some unwanted behaviors (anxiety, reactivity, aggression, cognitive dysfunction)^{1,28,33-38}.

At this time, there is inadequate research to know if the benefit from remaining intact is due to gonadal steroids, other factors produced by the gonads, interaction between the hypothalamic-pituitary-gonad axis, or an interaction that is not yet defined between the reproductive organs and

other body systems. It is possible that performing gonad sparing surgery will not provide the same benefit to the animal as remaining entirely intact.

There is no research specifically studying the advantages and disadvantages of gonad sparing surgeries, so recommendations are based on available research regarding benefits and risks of gonadal steroids on health and longevity, as well as the positive and negative impacts of neutering^{1,39-42}. This research, coupled with clinical experience, anecdotal reports and concerns based on comparisons to other similar diseases in the dog and other species need to be considered when deciding if the potential benefit of the gonad sparing procedure outweighs the potential complications.

With OSS, the uterus and cervix are completely removed, leaving behind either one or both ovaries. It is important that hysterectomy is complete, which means removing the cervix and tips of the uterine horns. If even a small portion of the uterus is left behind there is a risk of uterine pathology (e.g. stump pyometra) with the continued exposure to estrogen and progesterone that will follow.

The vaginal wall will not be as strong after complete hysterectomy as it was when the cervix was present because the contiguous vaginal wall and cervix have been replaced by fibrous tissue following surgery. If the bitch is accidentally mated, due to the large amount of prostatic fluid that can be produced, the vaginal wall has the potential to rupture, resulting in a potentially life-threatening peritonitis. Although there is no research studying the actual strength of the vaginal wall after hysterectomy, numerous clinicians have reported such situations, sometimes with fatal consequences. Since the cervix is completely removed, oversewing the vagina may prevent possible evisceration or peritonitis secondary to the pressure from an accidental breeding.

Bitches that have undergone hysterectomy without bilateral ovariectomy will not have bloody discharge when they are in proestrus/estrus as the blood emanates from the uterus, thus it is difficult for owners to know when they are in heat. The only signs a bitch may show are vulvar edema and receptive behavior. This could be problematic when these bitches are taken to public places (e.g. dog day care or dog parks) or if a bitch is left outside unattended while in heat. This may result in accidental breeding which could lead to vaginal rupture or spread of venereal disease (transmissible venereal tumor, brucellosis, herpesvirus). Owners must be counseled on the importance of preventing accidental breeding in bitches that have undergone this procedure. Veterinarians must be vigilant when obtaining history as to how the bitch was sterilized because vaginal rupture or venereally transmitted diseases may not otherwise be on a differential list, thus delaying appropriate treatment.

Tubal ligation, if properly performed, will result in effective contraception, however, there is the same risk of development of subacute endometritis-cystic endometrial hyperplasia-pyometra complex, as an intact bitch⁴³⁻⁴⁸. Thus, the only advantage of tubal ligation over remaining intact is the prevention of pregnancy.

With tubal ligation and OSS, erratic cycling behavior may develop as the bitches age due to development of follicular cysts or neoplasia. This risk is no greater than in an aging intact bitch, but surgical removal of the abnormal ovary may be more difficult following OSS, because the mesometrium and uterus are not present to access and elevate the ovary. Removal may also be more difficult due to fibrosis of the ovarian artery ligature site to the body wall, kidney, mesentery, or other adjacent tissues due to tissue reaction from the suture placed to ligate the utero-ovarian vessels.

Risks of anesthesia and surgery should also be considered. Bitches undergoing OSS and tubal ligation have a greater likelihood of needing to undergo a second procedure to later remove the ovary(ies) that have been left behind should they develop pyometra, mammary cancer, ovarian cancer or ovarian follicular cysts.

Vasectomy of male dogs prevents fertility, but has no effect on testosterone production, the ability to copulate, or the potential development of prostatic or testicular disease. Chemical castration reduces, but may not eliminate, testosterone production and the effects on development of prostatic and testicular disease are unknown. Repeat surgery to fully castrate a male dog is typically less complicated than in the bitch, however it still carries the risk of multiple anesthetic events.

1. Root Kustritz M V. Effects of surgical sterilization on canine and feline health and on society. *Reprod Domest Anim.* 2012;47(SUPPL.4):214-222. doi:10.1111/j.1439-0531.2012.02078.x
2. Waters DJ, Kengeri SS, Clever B, et al. Exploring mechanisms of sex differences in longevity: Lifetime ovary exposure and exceptional longevity in dogs. *Aging Cell.* 2009;8(6):752-755. doi:10.1111/j.1474-9726.2009.00513.x
3. Bronson R. variation in age at death of dogs of different sexes and breeds.pdf. *Am J Vet Res.* 1982;43(11):2057-2059.
4. Cooley DM, Schlittler DL, Glickman LT, Hayek M, Waters DJ. Exceptional Longevity in Pet Dogs Is Accompanied by Cancer Resistance and Delayed Onset of Major Diseases. *J Gerontol.* 2003;58A(12):1078-1084.
5. Kengeri SS, Maras AH, Suckow CL, Chiang EC, Waters DJ. Exceptional longevity in female Rottweiler dogs is not encumbered by investment in reproduction. *Age (Omaha).* 2013;35:2503-2513. doi:10.1007/s11357-013-9529-8
6. Waters DJ. In search of a strategic disturbance : some thoughts on the timing of spaying. *Clin Theriogenology.* 2011;3:433-437.
7. Michell AR. Longevity of British breeds of dog and its relationships with sex , size, cardiovascular variables and disease. *Vet Rec.* 1999;145:625-630.
8. Hoffman JM, Creevy KE, Promislow DEL. Reproductive Capability Is Associated with Lifespan and Cause of Death in Companion Dogs. *PLoS One.* 2013;8(4):1-7. doi:10.1371/journal.pone.0061082

9. Waters DJ, Kengeri SS, Maras AH, Chiang EC. Probing the perils of dichotomous binning : How categorizing female dogs as spayed or intact can misinform our assumptions about the lifelong health consequences of ovariohysterectomy. *Theriogenology*. 2011;76(8):1496-1500. doi:10.1016/j.theriogenology.2011.06.017
10. Smith AN. The Role of Neutering in Cancer Development Neuter Cancer Sex hormone Spay Castration. *Vet Clin NA Small Anim Pract*. 2014;44(5):965-975. doi:10.1016/j.cvsm.2014.06.003
11. Cooley DM, Beranek BC, Schlittler DL, Glickman NW, Glickman LT WD. Endogenous gonadal hormone exposure and bone sarcoma risk. *Cancer Epidemiol*. 2002;11:1434-1440.
12. Ru G, Terracini B GL. Host related risk factors for canine osteosarcoma. *Vet J*. 1998;156(1):31-39.
13. Hart BL, Hart LA, Thigpen AP, Willits NH. Neutering of German Shepherd Dogs : associated joint disorders , cancers and urinary incontinence. *Vet Med Sci*. 2016;2(3):191-199. doi:10.1002/vms3.34
14. Torres G, Riva D, Hart BL, et al. Neutering Dogs : Effects on Joint Disorders and Cancers in Golden Retrievers. *PLoS One*. 2013;8(2):1-7. doi:10.1371/journal.pone.0055937
15. Prymak C, McKee LJ, Goldschmidt MH GL. epidemiologic, clinical, pathologic, and prognostic characteristics of splenic hemangiosarcome and splenic hematoma in dogs: 217 cases. *J Am Vet Med Assoc*. 1988;193(6):706-712.
16. Hart BL, Hart LA, Thigpen AP, Willits NH. Long-Term Health Effects of Neutering Dogs : Comparison of Labrador Retrievers with Golden Retrievers. *PLoS One*. 2014;9(7):1-10. doi:10.1371/journal.pone.0102241
17. Sorenmo KU, Shofer FS, Goldschmidt MH. Effect of Spaying and Timing of Spaying on Survival of Dogs with Mammary Carcinoma. *J VEt Intern Med*. 2000;14:266-270.
18. Sonnenschein EG, Glickman LT Goldschmidt MH ML. body conformation, diet, and risk of breast cancer in pet dogs: A case-control study. *Am J Epidemiol*. 1991;133(7):694-703.
19. Zatloukal J, J L, F T, A N, H K, Kohout P. Breed and Age as Risk Factors for Canine Mammary Tumours. *Acta Vet BRNO*. 2005;74:103-109.
20. Perez Alenza MD, Pena L, del Castillo N, Nieto AI. Factors influencing the incidence and prognosis of canine mammary tumours. *J Sm An Pr*. 2000;41:287-291.
21. Villamil JA, Henry CJ, Hahn AW, Bryan JN, Tyler JW, Caldwell CW. Hormonal and sex impact on the epidemiology of canine lymphoma. *J Cancer Epidemiol*. 2009;59:1753-1759. doi:10.1155/2009/591753
22. Knapp DW, Ramos-vara JA, Moore GE, Dhawan D, Bonney PL, Young KE. Urinary Bladder Cancer in Dogs, a Naturally Occurring Model for Cancer Biology and Drug Development. *Lab Anim Res J*. 2018;55(1). doi:10.1093/ilar/ilu018
23. Norris AM, Laing EJ, Valli VE, et al. Canine Bladder and Urethral Tumors : A

- Retrospective Study of 115 Cases (1980-1985). *J Vet Internal Med.* 1992;145-153.
24. White CR, Hohenhaus AE, Kelsey J, Procter-gray E. Cutaneous MCTs : Associations with Spay / Neuter Status , Breed , Body Size , and Phylogenetic Cluster. *J Am Anim Hosp Assoc.* 2011;47(3):210-216. doi:10.5326/JAAHA-MS-5621
 25. Thrusfield MV, Holt PE, Muirhead RH. Acquired urinary incontinence in bitlhes : its incidence and relationship to neutering practices. *J Sm An Pr.* 1998;39:559-566.
 26. Bleser B De, Brodbelt DC, Gregory NG, Martinez TA. The association between acquired urinary sphincter mechanism incompetence in bitches and early spaying : A case-control study. *Vet J.* 2011;187(1):42-47. doi:10.1016/j.tvjl.2009.11.004
 27. Beuvais W, Cardwell JM BD. The effect of neutering on the risk of urinary incontinence in bitches – a systematic review. *J Sm An Pr.* 2012;53:198-204. doi:10.1111/j.1748-5827.2011.01176.x
 28. Lane D. Spay and Neuter Surgery ’ s Effects on Orthopedic Disease , Behaviour , and General Health in Dogs Orthopedic disease. International Association of Animal Behavior Consultants.
 29. Duval JM, Budsberg SC, Flo GL SJ. breed, sex, body weight as risk factors for rupture of the cranial cruciate ligament in young dogs. *J Am Vet Med Assoc.* 1999;215(6):811-814.
 30. Whitehair JG, Vasseur PB WN. epidemiology of cranial cruciate ligament rupture in dogs.pdf. *J Am Vet Med Assoc.* 1993;203(7):1016-1019.
 31. Sundburg CR, Belanger JM, Bannasch DL, Famula TR, Oberbauer AM. Gonadectomy effects on the risk of immune disorders in the dog : a retrospective study. *BMC Vet Res.* 2016;12:278-287. doi:10.1186/s12917-016-0911-5
 32. L LS, Mingyin Y, Mansen W, Elliott DA, Buff PR, Lund EM. Effect of age at gonadectomy on the probability of dogs becoming overweight. *J Am Vet Med Assoc.* 2013;243(2):236-243.
 33. V O, Peachey E. Behavioural effects of ovario-hysterectomy on bitches. *J Sm An Pr.* 1990;31:595-598.
 34. Hart BL. Effect of gonadectomy on subsequent development of age-related cognitive impairment in dogs. *J Am Vet Med Assoc.* 2001;219(1):51-56.
 35. Kim HH, Yeon SC, Houpt KA, Lee HC, Chang HH, Lee HJ. Effects of ovariohysterectomy on reactivity in German Shepherd dogs. *Vet J.* 2006;172:154-159. doi:10.1016/j.tvjl.2005.02.028
 36. Podberscek AL, Serpell JA. The English Cocker Spaniel : preliminary findings on aggressive behaviour. *Appl Anim Behav Sci.* 1996;47:75-89.
 37. Salman MD, Hutchison J, Ruch-gallie R, Kogan L, Kass PH, Scarlett JM. Behavioral Reasons for Relinquishment of Dogs and Cats to 12 Shelters. *J Appl Anim Welf Sci.* 2000;3(2):93-106.
 38. Hart BL, Eckstein RA. The role of gonadal hormones in the occurrence of objectionable

- behaviours in dogs and cats '. *Appl Anim Behav Sci.* 1997;52:331-344.
39. Kustritz MVR. Population Control in Small Animals. *Vet Clin NA Small Anim Pract.* 2018;48(4):721-732. doi:10.1016/j.cvsm.2018.02.013
 40. Kustritz MVR. Determining the optimal age for gonadectomy of dogs and cats. *J Am Vet Med Assoc.* 2007;231(11):1665-1675. doi:10.2460/javma.231.11.1665
 41. Reichler IM. Gonadectomy in Cats and Dogs : A Review of Risks and Benefits. *Reprod Dom Anim.* 2009;44(Suppl 2):29-35. doi:10.1111/j.1439-0531.2009.01437.x
 42. Palmer C, Corr S, Sandøe P, Palmer C, Corr S, Sandøe P. Inconvenient Desires : Should We Routinely Neuter Companion Animals ? Inconvenient Desires : Should We Routinely Neuter Companion Animals ? *Anthrozoos.* 2016;25(August):S153-172. doi:10.2752/175303712X13353430377255
 43. Weikel JH, Nelson LW. Problems in evaluating chronic toxicity of contraceptive steroids in dogs. *J Toxicol Environ Health.* 1977;3(1-2):167-177. doi:10.1080/15287397709529556
 44. Schlafer DH. Diseases of the Canine Uterus. *Reprod Dom Anim.* 2012;47(6):318-322. doi:10.1111/rda.12064
 45. Mir F, Fontaine E, Albaric O, et al. Findings in uterine biopsies obtained by laparotomy from bitches with unexplained infertility or pregnancy loss : An observational study. *Theriogenology.* 2013;79(2):312-322. doi:10.1016/j.theriogenology.2012.09.005
 46. Memon MA MW. Diagnosis and treatment of closed-cervix pyometra in the bitch. *J Am Vet Med Assoc.* 1993;203(4):509-512.
 47. Schlafer DH, Gifford AT. Cystic endometrial hyperplasia , pseudo-placentational endometrial hyperplasia , and other cystic conditions of the canine and feline uterus. *Theriogenology.* 2008;70:349-358. doi:10.1016/j.theriogenology.2008.04.041
 48. Pretzer SD. Clinical presentation of canine pyometra and mucometra : A review. *Theriogenology*2. 2008;70:359-363. doi:10.1016/j.theriogenology.2008.04.028