

## Early Spay-Neuter Considerations for the Canine Athlete: One Veterinarian's Opinion

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Those of us with responsibility for the health of canine athletes need to continually read and evaluate new scientific studies to ensure that we are taking the most appropriate care of our performance dogs. This article reviews scientific evidence that, taken together, suggests that veterinarians and owners working with canine athletes should revisit the current standard protocol in which all dogs that are not intended for breeding are spayed and neutered at or before 6 months of age. The results of a number of publications are briefly summarized in the areas of orthopedics, cancer, behavior, and other health considerations.

### Orthopedic Considerations

- *Bitches spayed at 7 weeks had significantly **delayed closure of growth plates** as compared to those spayed at 7 months, and those spayed at 7 months had significantly delayed closure of growth plates as compared to those left intact.*(1) *In a study of 1444 Golden Retrievers, bitches and dogs spayed or neutered at less than a year of age were significantly taller than those spayed or neutered after a year of age.*(2)
- *In a study of 203 agility dogs, the author demonstrated that the **tibia and radius and ulna were significantly longer** than the femur and humerus, respectively, in dogs that were spayed or neutered at or prior to 8 months of age as compared to intact dogs.*(M.C. Zink, unpublished data)
- *Several studies have shown that spayed and neutered dogs have a significantly higher prevalence of **CCL rupture** (3–6), even when controlling for body size.*(3)
- *Dogs that were neutered at least 6 months prior to a diagnosis of **hip dysplasia** were 1.5 times more likely to develop hip dysplasia than sexually intact dogs.*(7)
- *Spayed/neutered dogs had 3.1 times higher incidence of **patellar luxation**.*(8)

**Discussion:** Dogs that have been spayed or neutered at or before puberty can often be identified by their longer limbs, lighter bone structure, narrower chests and narrower skulls than intact dogs of the same breed. This differential growth frequently results in significant alterations in body proportions and particularly the lengths (and therefore weights) of certain bones relative to others. For example, if the femur has achieved its genetically determined normal length at 8 months, prior to a dog being spayed or neutered, but the tibia (which normally stops growing at 12 to 14 months of age) continues to elongate for several months after that point because of the removal of the sex hormones, then the relationship between the femur and tibia will be different than what was genetically determined. This may result in an abnormal angle at the stifle and a longer (and therefore heavier) tibia placing increased stress on the cranial cruciate ligament (of the knee or stifle joint). It is well known that spayed and neutered dogs are more likely to be overweight or obese than sexually intact dogs (9), and this can be a contributing factor to orthopedic diseases. Thus, keeping the spayed/neutered canine athlete lean can help mitigate the increased risk of orthopedic conditions.

### Cancer Considerations

- *Spayed females had more than 5 times greater risk than intact bitches of developing **cardiac hemangiosarcoma** and neutered males had 1.6 times higher risk than intact males had of developing cardiac hemangiosarcoma.*(10)
- *Spayed females had 2.2 times increased risk for developing **splenic hemangiosarcoma**.*(11)
- *Male and female Rottweilers that were neutered or spayed before a year of age had 3.8 and 3.1 times greater risk, respectively, of developing **bone cancer** than intact dogs.*(12) *In a second study, spayed/neutered dogs had a 2.2 times higher risk of developing bone cancer than intact dogs.*(13)
- *Neutered dogs had a 2.8 times greater risk for developing any **prostate tumor** than intact dogs.*(14) *Neutered dogs had a 4.3 times higher risk of developing prostate carcinoma.*(15, 16)
- *Neutered dogs had a 3.6 higher risk for developing transitional cell carcinoma of the **bladder** than intact dogs, and a 3 times greater risk of developing any bladder tumor.*(14) *Spayed/neutered dogs had more than 4 times greater risk for developing transitional cell carcinoma of the bladder than intact dogs.*(17)

- *In a survey of 2505 Vizslas, spayed or neutered dogs were found to have a significantly higher risk of mast cell cancer, hemangiosarcoma, lymphoma and all cancers together than intact dogs.*(18)

**Discussion:** One study indicated a slightly increased risk of mammary cancer in female dogs after one heat cycle (8% increase), greater risk with two heats (26% increase) and increased risk with each subsequent heat.(19) However, a recent systematic review of the publications that advocate neutering to reduce the risk of mammary tumors in dogs indicated that 9 of 13 reports had a high risk of bias and the remaining 4 had a moderate risk of bias. This study concluded that the evidence that neutering reduces the risk of mammary cancer is weak and do not constitute a sound basis for firm recommendations.(20) Additionally, at the time when several of these studies were conducted (late 1960s), it was found that incidence rates for all malignant neoplasms were 453.4/100,000 female dogs. Mammary tumors accounted for half of these tumors, or 198.8/100,000. Thus, the actual overall risk at that time of any bitch getting a mammary tumor was only 0.2%.(21) In any case, the figures for increased risk of mammary cancer must be compared with the 200 to 400% increased risk of other cancers in spayed females. While about 30% of mammary cancers are malignant (22), as in humans, when caught and surgically removed early, the prognosis is very good.(23) This is in comparison to the other cancers listed, such as hemangiosarcoma and bladder cancer, which are often fatal. Given the balance of cancer risks listed above, owners of canine athletes should strongly consider leaving the ovaries intact for at least two heat cycles. In addition, the veterinary field should be developing programs for regular examinations including imaging to facilitate early diagnosis of mammary cancer in all intact female dogs, as has been performed in women for decades.

### Behavior Considerations

- *Early age gonadectomy was associated with an increased incidence of noise phobias and undesirable sexual behaviors, such as mounting.*(24)
- *Significantly more behavioral problems in spayed and neutered bitches and dogs, with fearful behavior being most common in spayed bitches and aggression in neutered dogs.*(25, 26)
- *In a prospective study, German Shepherd Dogs spayed between 5-10 months of age had significantly increased reactivity.*(27)

**Discussion:** A number of the early studies claiming to show positive behavioral effects of spay/neuter were significantly flawed. For example, one of the most often quoted publications to support improvements in behavior, particularly aggression, after gonadectomy does not actually provide any statistical analysis. Additionally, 88% of owners of dogs in this study stated that their reason for castrating the dog was to attempt to resolve an existing behavior problem. Owners were also surveyed regarding the dog's behavior a mean of 27 months post-castration. These factors likely introduced a significant amount of bias.(28) Another performed statistical analysis but showed that the age when the dog was neutered was not correlated with the degree of improvement.(29) Most critically, neither of these two studies included a control group of intact dogs. One of the more important undesirable behavioral effects of spay/neuter for canine athletes was a finding of a significantly lowered energy level. This was shown in a study that was well controlled and examined over 3500 dogs.(26)

### Other Health Considerations

- *Female, and sometimes male, dogs that are spayed/neutered before puberty have an increased risk of urinary incontinence and it is more severe in bitches spayed earlier.*(30-33)
- *Spayed female dogs displayed a significantly higher risk or hypothyroidism when compared to intact females.*(34) *A health survey of several thousand Golden Retrievers showed that spayed or neutered dogs were more likely to develop hypothyroidism.*(2) *Neutered male and spayed female dogs had higher relative risks of developing hypothyroidism than intact females.*(35)
- *Neutered females had a 22 times increased risk of developing fatal acute pancreatitis (multivariate analysis) as compared to intact females.*(36)
- *Risk of adverse reactions to vaccines is 27 to 38% greater in neutered dogs as compared to intact.*(37)
- *In a study of female Rottweilers there was a strong positive association between retention of the ovaries and longevity.*(38)

### Summary

I have gathered these studies to show that the practice of routinely spaying or neutering every dog at or before the age of 6 months is not a black-and-white issue. Clearly more studies need to be undertaken to evaluate the effects of prepubertal spaying and neutering, particularly in canine athletes. After examining the risks and benefits, I have significant concerns with removal of the gonads in both males and females. It is clear that the gonads are not just important for reproduction, but play a critical role in growth, development and long-term health.

## Preventing Procreation

If we leave the gonads intact, how can we prevent the production of unwanted dogs? For *males*, the obvious solution is to keep them away from bitches in heat. But if an owner needs more certainty that a dog will not be bred, the answer is to perform a vasectomy. One possible disadvantage is that vasectomy does not prevent some unwanted behaviors associated with males such as marking and humping. On the other hand, females and neutered males frequently participate in these behaviors too. Training is the most effective solution to these behaviors. Another potential issue is finding a veterinarian who can perform the procedure. Veterinary schools do not currently teach students how to perform vasectomies. However, the methodology has been described and any board-certified surgeon can learn the technique. For a list of veterinarians who will perform the technique, contact the author at [mczink@caninesports.com](mailto:mczink@caninesports.com).

In *females*, the issues are more complex, because having a bitch in heat is inconvenient for most owners and leaving the uterus intact substantially increases the risk of pyometra (a serious, potentially fatal uterine infection). One solution is to perform a hysterectomy (removal of the uterus), leaving the ovaries intact. Unfortunately, to my knowledge the effects of this technique on female dogs have never been studied. For example, we do not know whether these dogs would continue to ovulate and perhaps show behavioral changes, although it is likely that there would be no visible heat cycle, since there would be no uterine discharge. Further, dogs that have this surgery will have intact ovaries, so veterinarians need to establish an effective monitoring system for early detection of mammary cancer in intact bitches, as is available for women. In addition, there is the possibility of the dog developing stump pyometra if small amounts of uterine tissue are left behind during the hysterectomy.

For *males with retained testicles*, there is a logical solution, based on fact. A large prospective study showed that the incidence of testicular cancer in cryptorchid dogs was 12.7/1000 dog-years at risk.(39) In other words, if 100 dogs with retained testicles live to be 10 years old, approximately 13 of them will develop cancer in the retained testicle. The average age at which tumors develop in undescended testes is 8.7 years.(40) These tumors are commonly benign, though they can grow quite large. Based on this study, I recommend that dogs with retained testicles have surgery to remove the retained testicle some time during the first three years of life and at that time they have a vasectomy on the remaining spermatic cord. This solution allows the dog to have the benefit of its sex hormones, but prevents passing this likely genetic condition on to offspring.

Most of all, it is important that we assess each dog and its living situation individually, weighing the risks and benefits of removal of the gonads. *There is no single solution that fits every dog.*



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