



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 provides evidence through a number of recent studies to suggest that veterinarians and owners working with canine athletes should revisit the standard protocol in which all dogs that are not intended for breeding are spayed and neutered at or before 6 months of age.

Orthopedic Considerations

A study by Salmeri et al in 1991 found that bitches spayed at 7 weeks grew significantly taller than those spayed at 7 months, who were taller than those not spayed (or presumably spayed after the growth plates had closed).(1) A study of 1444 Golden Retrievers performed in 1998 and 1999 also found bitches and dogs spayed and neutered at less than a year of age were significantly taller than those spayed or neutered at more than a year of age.(2) The sex hormones, by communicating with a number of other growth-related hormones, promote the closure of the growth plates at puberty (3), so the bones of dogs or bitches neutered or spayed before puberty continue to grow. Dogs that have been spayed or neutered well before puberty can frequently be identified by their longer limbs, lighter bone structure, narrow chests and narrow skulls. This abnormal 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 when a dog gets spayed or neutered, but the tibia, which normally stops growing at 12 to 14 months of age continues to grow, then an abnormal angle may develop at the stifle. In addition, with the extra growth, the lower leg below the stifle likely becomes heavier (because it is longer), and may cause increased stresses on the cranial cruciate ligament. In addition, sex hormones are critical for achieving peak bone density.(4) These structural and physiological alterations may be the reason why at least one recent study showed that spayed and neutered dogs had a higher incidence of **CCL rupture**.(5) Another recent study showed that dogs spayed or neutered before 5 1/2 months had a significantly higher incidence of **hip dysplasia** than those spayed or neutered after 5 1/2 months of age, although it should be noted that in this study there were no standard criteria for the diagnosis of hip dysplasia.(6) Nonetheless, breeders of purebred dogs should be cognizant of these studies and should consider whether or not pups they bred were spayed or neutered when considering breeding decisions.

Cancer Considerations

A retrospective study of cardiac tumors in dogs showed that there was a 5 times greater risk of **hemangiosarcoma**, one of the three most common cancers in dogs, in spayed bitches than intact bitches and a 2.4 times greater risk of hemangiosarcoma in neutered dogs as compared to intact males.(7) A study of 3218 dogs demonstrated that dogs that were neutered before a year of age had a significantly increased chance of developing **bone cancer**.(8) A separate study showed that neutered dogs had a two-fold higher risk of developing bone cancer.(9) Despite the common belief that neutering dogs helps prevent prostate cancer, at least one study suggests that neutering provides no benefit.(10) There certainly is evidence of a slightly increased risk of mammary cancer in female dogs after one heat cycle, and for increased risk with each subsequent heat. While about 30 % of mammary cancers are malignant, as in humans, when caught and surgically removed early the prognosis is very good.(12) Luckily, canine athletes are handled frequently and generally receive prompt veterinary care.

Behavioral Considerations

The study that identified a higher incidence of cranial cruciate ligament rupture in spayed or neutered dogs also identified an increased incidence of **sexual behaviors in males and females** that were neutered early.(5) Further, the study that identified a higher incidence of hip dysplasia in dogs neutered or spayed before 5 1/2 months also showed that early age gonadectomy was associated with an increased incidence of **noise phobias and undesirable sexual behaviors**.(6) A recent report of the American Kennel Club Canine Health Foundation reported significantly more behavioral problems in spayed and neutered bitches and dogs. The most commonly observed behavioral problem in spayed females was **fearful behavior** and the most common problem in males was **aggression**.(12)

Other Health Considerations

A number of studies have shown that there is an increase in the incidence of **female urinary incontinence** in dogs spayed early (13), although this finding has not been universal. Certainly there is evidence that ovarian hormones are critical for maintenance of genital tissue structure and contractility.(14, 15) Neutering also has been associated with an increased likelihood of **urethral sphincter incontinence in males**.(16) This problem is an inconvenience, and not usually life-threatening, but nonetheless one that requires the dog to be medicated for life. A health survey of several thousand Golden Retrievers showed that spayed or neutered dogs were more likely to develop **hypothyroidism**.(2) This study is consistent with the results of another study in which neutering and

spaying was determined to be the most significant gender-associated risk factor for development of hypothyroidism.(17) **Infectious diseases** were more common in dogs that were spayed or neutered at 24 weeks or less as opposed to those undergoing gonadectomy at more than 24 weeks.(18) Finally, the AKC-CHF report demonstrated a higher incidence of **adverse reactions to vaccines** in neutered dogs as compared to intact.(12)



I have gathered these studies to show that our 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 done to evaluate the effects of prepubertal spaying and neutering, particularly in canine athletes.

Currently, I have significant concerns with spaying or neutering canine athletes before puberty. But of course, there is the pet overpopulation problem. How can we prevent the production of unwanted dogs while still leaving the gonads to produce the hormones that are so important to canine growth and development? One answer would be to perform vasectomies in males and tubal ligation in females, to be followed after maturity by ovariectomy in females to prevent mammary cancer and pyometra. 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. Really, training is the best solution for these issues. Another possible disadvantage is finding a veterinarian who is experienced in performing these procedures. Nonetheless, some do, and if the procedures were in greater demand, more veterinarians would learn them.

I believe it is important that we assess each situation individually. For canine athletes, I currently recommend that dogs and bitches be spayed or neutered after 14 months of age.

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