

Rebuttal to “Early Spay-Neuter Considerations for the Canine Athlete”

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I have written a rebuttal to Dr. Zink’s article entitled “Early Spay-Neuter Considerations for the Canine Athlete” in which Dr. Zink attempts to make an argument for revisiting the “standard protocol in which all dogs that are not intended for breeding are spayed and neutered at or before 6 months of age.” In his discussion, Dr. Zink quotes manuscripts incorrectly in some instances, doesn’t present *all* of the data from given studies (ie, misrepresenting the findings of the studies) in other instances, and doesn’t include the interpretation of the data by the study’s authors (leading to erroneous interpretations of some data by Dr. Zink) in yet other instances. While I typically don’t write rebuttals to others’ writings, or opinions (after all, we are all entitled to our opinions), the multiple errors and misrepresentations of the scientific literature quoted in this dissertation compelled me to “set the record straight” with regard to the literature being incorrectly cited by Dr. Zink. While I respectfully disagree with Dr. Zink’s opinion on the appropriate age at which to spay and castrate dogs not intended for breeding, my primary purpose for this rebuttal is to present the literature that Dr. Zink cites in a more accurate, and more complete, fashion so that the veterinarian reader may reach their own conclusions regarding the most appropriate time to spay or castrate the nonbreeding animal, *based upon accurate representation of the scientific literature.*

Orthopedic Considerations

Dr. Zink points out correctly that in Salmeri’s 15-month study (examining the effects of prepubertal gonadectomy on skeletal growth, weight gain, food intake, body fat, and secondary sex characteristics in 32 mixed-breed dogs neutered at seven weeks or seven months or left intact) that bitches spayed at 7 weeks grew significantly taller than those spayed at 7 months, and that those spayed at 7 months has significantly delayed closure of the growth plates (but didn’t grow significantly taller) than those not spayed (Salmeri, 1991). However, the concerns expressed by Dr. Zink regarding changes in stifle joint angles are not supported by any existing literature, and don’t make sense as an argument against “early age” gonadectomy (ie, gonadectomy performed well before 6 months of age). Since the animal that is gonadectomized early will not have likely had closure of any of the hind limb long bone physes, it stands to reason that closure of all of the physes will be delayed resulting in longer, but proportional, bone growth as related to the stifle joint. In fact, Salmeri’s study did not identify any changes in the proportional nature of bone growth of the forelimb (she was studying growth and maturation of the radius and ulna). It seems that Dr. Zink may be arguing against performing gonadectomy during the time period between 7 or 8 months of age and final closure of all the growth plates, which isn’t relevant to a discussion of “early age” gonadectomy. Dr. Zink’s speculation regarding joint angles cannot be applied to, and isn’t discussed in, the article cited regarding increased incidence of cranial cruciate ligament rupture in gonadectomized dogs. There is no information in the article (Cooley, 2002) as to the timing of gonadectomy in the study population, so there is no way of knowing if animals were spayed/castrated after adulthood, at the “traditional age”, or at an “early age”, and it is, therefore, not appropriate for Dr. Zink to be applying his theory to that article. In fact, in the article, bone lengths and joint angles are never mentioned, and the authors speculate their findings may be attributable to: “alterations in sex hormones may affect the size, shape, or material properties of the ACL.”

Regarding hip dysplasia, long-term studies have examined the incidence of hip dysplasia in dogs and the association with age at gonadectomy, and Dr. Zink quotes one of them. The study of 1842 dogs found that early age gonadectomy was associated with a significant increased incidence of hip dysplasia (Spain, 2004). Puppies that underwent gonadectomy before 5.5 months of age had a 6.7% incidence of hip dysplasia, while those that underwent gonadectomy at the more traditional age had an incidence of 4.7%. However, Dr. Zink fails to note the additional finding of that study which included finding that those dogs that were gonadectomized at the traditional age were *three times more likely to be euthanized* for the condition as compared to the early age group, leading the authors to suggest that early age gonadectomy may be associated with a less severe form of hip dysplasia.

Cancer Considerations

Dr. Zink states: “There is a slightly increased risk of mammary cancer if a female dog has one heat cycle.” Others would tend to believe, based on the scientific literature, that there is more than a “slightly increased” risk. In fact, the literature states that the risk of developing mammary tumors in dogs spayed prior to the first estrus is 0.5%, *8% after the first estrus, and after the second estrus the risk will increase to 26%* (Schneider, 1969). The sparing effect of OHE is lost after females have cycled more than twice or are older than 2.5-4 years of age. Hence, this is one of the reasons veterinarians recommend spaying *before* the first heat cycle. Mammary neoplasms are the most common tumors of the female dog (MacEwen, 1996). Additionally, the rate of malignancy of mammary tumors in dogs is typically considered to be closer to 50% (rather than the 30% stated by Dr. Zink) and clearly a significant problem in the intact female dog (Brodey, 1983; Gilbertson, 1983). Dr. Zink then goes on to state his own personal belief that canine athletes have more problems with cranial cruciate ligament injury than with mammary neoplasia. Clearly, there is no information in the literature to support such a statement, or comparison. This is comparing apples and oranges, and not appropriate. As with human athletes, it is probably appropriate to believe that the canine athlete will suffer athletic injuries (ie, torn cruciate ligaments, etc.), but to

compare disease entities, and make statements about the prevalence of these entities (based upon personal biases) is not valid.

Related to the incidence of cardiac tumors, the study by Ware, et al., has been misquoted when Dr. Zink stated that: "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.*" The study, in fact, stated that "the relative risk of a tumor in *intact males* was 2.44 times the risk in *intact females*" (Ware, 1999). That study did show that the relative risk for hemangiosarcoma in spayed females was >5 times that for intact females, but "that castrated males had only a slightly greater risk (1.6 times) of developing a heart tumor than did intact males." The exact cause for the increased risk in spayed females, as compared to intact females was not identified. It is important to recognize that cardiac tumors are not common compared to other tumor types (including mammary neoplasia in the intact bitch) and the overall incidence of cardiac tumors in that study was 0.19%.

Osteosarcoma has been demonstrated in some studies to occur more frequently in gonadectomized dogs, however, one of the studies cited by Dr. Zink has been mischaracterized. Dr. Zink describes Cooley's study as "a study of 3218 dogs" in which dogs neutered before a year of age were found to have a significantly increased chance of developing bone cancer." In reality, however, Cooley's study is a study of *683 Rottweiler breed dogs* (Cooley, 2002). Rottweilers were selected for the study, as stated by the authors of the study, because their risk of bone sarcoma is very high compared with other breeds. The study found that bone sarcoma was diagnosed in 12.6% of the dogs, and that male and female dogs that underwent gonadectomy before 1 year of age (can't be defined as "early age" gonadectomy) were significantly more likely to develop bone sarcoma than dogs that were sexually intact. The second study quoted by Zink did indeed find a twofold higher risk of osteosarcoma among neutered dogs as compared to intact dogs (Ru, 1998). This study involved 3062 purebred dogs with osteosarcoma as compared to 3959 purebred dogs without osteosarcoma. However, in that study, no information was reported regarding when surgical neutering took place, so it is inappropriate to apply this article to arguments pertaining to "early age" gonadectomy.

Regarding the relation of castration and neoplasia, it is well documented that prostatic neoplasia occurs in both intact and neutered male dogs, and that castration does not protect against the development of prostatic carcinoma (Obradovich, 1987; Krawiec, 1992; Bell, 1991; Barsanti, 2003). However, it is also well documented in the scientific literature that castration (including early castration) does help prevent other prostatic diseases seen in intact male dogs including benign prostatic hyperplasia, cystic hyperplasia, squamous metaplasia, paraprostatic cysts, prostatitis, and prostatic abscessation (Berry, 1986; Black, 1998; Cohen, 1995; White, 1987; Barsanti, 2003; Cowan, 1991; White, 1995; Hardie, 1984; Mullen, 1990).

Behavioral Considerations

Dr. Zink begins the discussion of behavioral considerations by incorrectly stating that "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 (Slauterbeck, 2004). In fact, Slauterbeck's paper *never* mentions *anything* about sexual behaviors. The next paper cited is Spain's paper which did demonstrate an increased incidence of noise phobias and undesirable sexual behaviors in the dogs undergoing early age gonadectomy (Spain, 2004). Dr. Zink fails to point out other behaviors that were *decreased* in dogs gonadectomized before 5.5 months, including escaping behavior, separation anxiety, and urinating in the house when frightened. The study also found that three behaviors were significantly associated with age at gonadectomy for males but not females, and included aggression towards family members, barking or growling at visitors, and excessive barking that bothered a household member. These three behaviors were significantly associated with one another, and were seen more frequently in males gonadectomized before 5.5 months of age. When looking at all the behaviors taken together, authors found that overall, the relinquishment rate was lowest among dogs gonadectomized before 5.5 months (7.5%), whereas those gonadectomized \geq 5.5 months of age had a higher relinquishment rate (10.4%). Howe's study of 269 dogs also showed that "early age" gonadectomy was not associated with higher return rate or increased rate of placement in another home after adoption, compared with traditional age gonadectomy (Howe, 2001). In that study, there was no difference in the incidence of overall or specific behavioral problems between age groups. Regarding the recent report of the American Kennel Club Canine Health Foundation, Dr. Zink stated that the study "reported *significantly more behavioral problems* in spayed and neutered bitches and dogs". However, upon reading the reference cited by Dr. Zink, there is no such finding reported in the paper (http://www.akcchf.org/pdfs/whitepapers/Biennial_National_Parent_Club_Canine_Health_Conference.pdf, 2005). The report does, however, note *2 behaviors seen more frequently* in neutered animals and the paper states that "male dogs had more aggression behavior problems and that females were more fearful. These differences were even more extreme when looking at only neutered animals, even after excluding animals neutered for behavior problems." The reference states that dogs were 1 year of age when studied, but doesn't report when dogs underwent gonadectomy (ie, at an "early age" or at the "traditional age").

Dr. Zink goes on to state that another study “showed that unneutered males were significantly less likely than neutered males to suffer cognitive impairment when they were older” (Hart, 2001). However, that study did *not* show that intact males were less likely than neutered males to suffer cognitive disorders when they were older. In fact, results of the paper demonstrated that “there were no significant differences among groups (gender status) in regard to percentages of dogs that progressed from not having any impairments to having impairments in 1 category or to having impairments in ≥ 2 categories”. Hence, the study showed that neutered male dogs were *not* any more likely to suffer cognitive disorders than intact dogs. However, what the study did show in dogs that were *already affected*, was that the “percentage of dogs that progressed from being mildly impaired (ie, impairments in 1 behavioral category) at the time of the first interview to being severely impaired (ie, impairments in ≥ 2 categories) at the time of the second interview was significantly higher for neutered than sexually intact male dogs.” However, it is important to note that the animals in this study were spayed at a mean age of 2.8 years (SD, 0.1) and the mean age for castration of the male dogs was 4.8 years (SD, 1.2), making the paper irrelevant to a discussion of “early age” gonadectomy.

Other Health Considerations

Dr. Zink mentions other health considerations that should be considered when deciding whether the canine athlete should undergo gonadectomy at, or before, 6 months of age. Dr. Zink states: “A number of studies have shown that there is an increase in the incidence of female urinary incontinence in dogs spayed early”, and gives one reference for this (Stocklin-Gautschi, 2001). Indeed, there have been several studies that have demonstrated an increased incidence of urinary incontinence in dogs spayed early, as well as a study that demonstrated a much higher incidence of urinary incontinence (20.1%) in bitches spayed *after* the first estrus, as compared to those spayed before the first estrus (Arnold, 1992). In fact, in the reference (Stocklin-Gautschi, 2001) that Dr. Zink quotes, the authors go on to interpret the findings of their study in relation to similarly performed studies, and then state in the discussion: “A comparison of the present results with those of Arnold, et al. (1992) indicates that the risk of urinary incontinence is *lower* in early spayed bitches than in bitches spayed after the first oestrus, but that the clinical signs of the affected animals are significantly more pronounced.” The authors continue and state: “However, assuming that most incontinent bitches respond well to medication, this factor is of minor importance. *This relative disadvantage of early spaying is negligible when compared with the benefits, such as lower incidence of urinary incontinence and the protection against mammary tumours.*” On the other hand, the recent study of 1842 dogs by Spain, et al., demonstrated that there *was* an increased incidence of urinary incontinence in female dogs, with the risk being greatest in females gonadectomized before 3 months of age, compared with those gonadectomized at, or after, 3 months of age (Spain, 2004). Based upon their findings, Spain concludes: “Because urinary incontinence was greater among puppies gonadectomized before 3 months of age and incontinence can be a lifelong condition requiring ongoing treatment, it is reasonable to conclude that female dogs should not be gonadectomized until at least 3 to 4 months of age.” The authors continue: “This may be particularly prudent for a shelter that does not have an excess of puppies and is focused on reducing medical and behavioral conditions that could lead to relinquishment of adolescent and adult dogs. Conversely, for shelters with excess puppies, the advantages of gonadectomy of all dogs before adoption may outweigh the risk of urinary incontinence.”

Dr. Zink also points out that neutering of male dogs has been associated with an increased likelihood of urethral sphincter incontinence (Aaron, 1996) and seems to imply that early neutering plays a role in this. However, when one examines Aaron’s paper, it becomes obvious that the dogs that developed urethral sphincter incompetency following castration were *adult* dogs when castrated, with the median age of onset of urinary incontinence being 6 years (range 6 months to 10.5 years), and the median period between castration and the onset of incontinence being 10 days (range “immediately” to 18 months). Clearly, this paper should not be quoted as an argument against early neutering (or late neutering, for that matter) in male dogs. Urethral sphincter incompetency is quite uncommon in male dogs, and is likely multifactorial in nature, considering male dogs don’t tend to respond well to hormonal replacement (Aaron, 1996). When one considers the incidence of prostatic hyperplasia, cysts, and abscesses in older male dogs (much higher than urethral sphincter incompetency), and the potential life threatening nature of some of these problems, the role for castration in preventative health care for male dogs becomes obvious.

Hypothyroidism is cited as another health reason to avoid early gonadectomy. Dr. Zink is correct that both the cited references (<http://www.grca.org/healthsurvey.pdf> and Panciera, 1994) do demonstrate that hypothyroidism occurs more commonly in gonadectomized dogs (including the Golden Retriever breed) than in intact dogs. While there is an association, the overall incidence of hypothyroidism is 0.2% in canines (Panciera, 1994 - although it may be higher in certain breeds such as the Golden Retriever and Doberman Pinscher). It would not be prudent to discourage spaying/castrating of dogs (early or not) to prevent a disease with such a low incidence that has a good response to treatment in most dogs (Panciera, 1994), when other diseases have much higher incidences (mammary neoplasia, pyometra, prostatic hyperplasia, etc.) and may not have as favorable an outcome.

Infectious diseases are cited as another reason to avoid early gonadectomy. While Dr. Zink does correctly state the findings of the cited reference which were that infectious diseases were more common in dogs spayed/castrated at 24 weeks of age or less as compared to those undergoing gonadectomy at more than 24 weeks (Howe, 2001), Dr. Zink fails to point out the conclusions of the author related to this issue. Howe notes in that article that: “Parvoviral enteritis was the most commonly reported infectious disease and was reported exclusively in dogs that underwent prepubertal

gonadectomy. Parvovirus enteritis is common from puppies from shelter environments, but uncommon in older dogs. *The potential influence of anesthesia and surgery on the incidence of parvoviral enteritis in puppies that underwent gonadectomy could not be determined in our study, because comparisons with puppies that did not undergo gonadectomy were not performed.* Spain's study of 1842 dogs also found that dogs gonadectomized before 5.5 months had a significantly greater incidence of parvoviral enteritis (as compared to those gonadectomized later), but went on to say: "In that study (Howe, 2001), as with ours, however, the increased rate of parvovirus infection probably represented increased susceptibility of dogs < 6 months of age during the periadoption period and not long-term immune suppression or long-term susceptibility as a result of early-age gonadectomy" (Spain, 2004).

Interestingly, Dr. Zink did not address one of the major health concerns of the unspayed bitch which is pyometra, a potentially life threatening condition. Pyometra occurs at a very high rate in unspayed bitches, and the incidence has been reported to approach 66% in bitches over 9 years of age (Johnston, 2001). Unlike the United States, in Scandinavian countries, female dogs are at risk of developing pyometra since elective neutering of healthy bitches is seldom performed, resulting in only 7% of bitches being spayed (Egenvall, 1999). A recent study in Sweden was conducted to assess the incidence of pyometra in bitches using data obtained from a Swedish pet insurance company, and it was found that overall, almost 25% of the insured dog population had developed pyometra by 10 years of age. In the three breeds at highest risk of developing the disease (rough-haired Collie, Rottweiler, Bernese Mountain Dog), approximately 50% of the bitches had experienced pyometra before reaching 10 years of age (Hagman, 2004). Pyometra can be a life threatening, and expensive to treat, condition that occurs with much greater frequency than rupture of the cranial cruciate ligament or cardiac tumors, and can easily be prevented by ovariohysterectomy.

In summary, while I respectfully disagree with Dr. Zink as to the most appropriate time at which to gonadectomize the animal that is not used for breeding purposes, it is important for any veterinarian to base their decisions upon a well versed understanding of the scientific literature. As new studies are performed, and our knowledge base grows as to the effects, both good and bad, of sterilization of pet animals (including "early age" gonadectomy), current recommendations may (or may not) be changed. With regard to the canine athlete, I would encourage those who feel that they are seeing certain problems more frequently in animals that have undergone early age gonadectomy (as compared to traditional age gonadectomy) to collect, and analyze, data and contribute the information to the scientific literature. Until such studies are performed, anecdotal information remains just that – anecdotal, unverified, and unsuitable for making broad sweeping recommendations regarding the appropriateness of spaying and castrating (at any age) animals that are not used for breeding purposes (or for making recommendations regarding tubal ligation/vasectomy which clearly don't have the same health benefits as gonadectomy).

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