

Effects of spay neuter programs on pets hormones bone cancer behavior and health

<http://www.royalair.org/spayingearly.htm>

Remember when everybody said taking estrogen did not increase breast cancer for years and years women were prescribed estrogen, because study after study said there was no increased risk in taking the drug. Then one very large study seemed to say there was a risk and many women stopped taking it on their own even though most doctors did not stop prescribing it women stopped taking it and all the sudden for the first time in years new breast cancer was greatly reduced- even though most doctors continued to say there was no harm???...well early spaying and neutering I believe in time will show as being harmful, yes you must spay or neuter I am just asking you to delay it until after your dog has grown.

Think of it this way if you were to take a boy of 2 years of age and deprive him of his testosterone, would he grow healthy muscles and bone? Hormones do lots of thing besides sexual development. They regulate growth, muscle, moods, brain- cognitive, feelings..hormones most significantly plays a roll in bone growth and density this study says 70% more likely to get HD if spayed before 5.5 months of age! Both estrogen and testosterone build bone.. A puppy spayed young will grow taller, generally will have a narrower chest and lighter bone and a smaller more narrow head , hen their unneutered counter parts.... SEE the behavior problems below too!

Falco and Mark have huge heads and I was always puzzled why some of their neutered males puppies had a significantly smaller heads often smaller than their parents heads. While some had heads just as big, I imagine if I were to look back, those with the smaller heads were neutered early...

The studies below there are several

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Long-Term Health Risks and Benefits Associated with Spay / Neuter in Dogs

Laura J. Sanborn, M.S.

May 14, 2007

Finding in bold- study below- some studies I have read have said 30 Times more of a risk (increase) in bone cancer!

On the negative side, neutering male dogs

- **if done before 1 year of age, significantly increases the risk of osteosarcoma (bone cancer); this is a common cancer in medium/large and larger breeds with a poor prognosis.**

- **increases the risk of cardiac hemangiosarcoma by a factor of 1.6**

- **triples the risk of hypothyroidism**

- **increases the risk of progressive geriatric cognitive impairment**

- **triples the risk of obesity, a common health problem in dogs with many associated health problems**

- **quadruples the small risk (<0.6%) of prostate cancer**

- **doubles the small risk (<1%) of urinary tract cancers**

- **increases the risk of orthopedic disorders (hip and elbow dysplasia) some studies say 10X!**

- **increases the risk of adverse reactions to vaccinations**

On the negative side, spaying female dogs

- **if done before 1 year of age, significantly increases the risk of osteosarcoma (bone cancer); this is a common cancer in larger breeds with a poor prognosis**

- **increases the risk of splenic hemangiosarcoma by a factor of 2.2 and cardiac hemangiosarcoma by**

- **a factor of >5; this is a common cancer and major cause of death in some breeds**

- **triples the risk of hypothyroidism**

- **increases the risk of obesity by a factor of 1.6-2, a common**

health problem in dogs with many associated health problems

- **causes urinary “spay incontinence” in 4-20% of female dogs**
- **increases the risk of persistent or recurring urinary tract infections by a factor of 3-4**
- **increases the risk of recessed vulva, vaginal dermatitis, and vaginitis, especially for female dogs spayed before puberty**
- **doubles the small risk (<1%) of urinary tract tumors**
- **increases the risk of orthopedic disorders (hip and elbow dysplasia) some studies say 10X!**
- **increases the risk of adverse reactions to vaccinations**

BAD BEHAVOIR = early spay and neuter

Spaying and Castration
Neutering
Spaying and Castration
(Neutering)

Neutering is the general term used for the surgical removal of the reproductive organs in both male and female dogs.

What Your Vet and the Rescue Centre's May Not Tell You

Neutering can make for a better and more affectionate family pet. It is a medical fact that spaying and castration can prolong the life of our pets and may reduce the number of health problems in later life. Females can benefit from spaying by reducing the incidence of uterine, mammary, and ovarian cancers. It can also reduce the incidence of uterine infections such as Pyometra.

Castrating a male reduces the risk of prostate and testicular cancer. They are less likely to develop unwanted behaviour's such as marking, sexual aggression, and mounting, they are also less likely to escape, roam, or fight with other dogs.

Some vets recommend that our dogs are spayed or neutered anywhere between 5 to 16 months. In America some are being done as early as 8 weeks and they routinely neuter at between four and six months. Many of the Vets, Trainers and Behaviourists in both America and the UK are recommending this course of action, without understanding the numerous problems this advice may create.

Some rescue centre's such as the RSPCA often spay and neuter as a matter of course, whatever the age. In fact I have written an article pointing to the fact that a few of our "Welfare Societies" are neutering both male and female dogs as young as SIX WEEKS.

I have some very serious reservations about neutering, even at six months but six weeks is ludicrous, I believe that for the behavioral health of our dogs this advice and practice must stop. See the RSPCA article. [Click Here](#)

There have been numerous scientific studies on the beneficial outcome of neutering, especially on a physiological level. But none I can find on a psychological and behavioural level.

I noted some six years ago that the incidence of frustration, lack of attention, and puppy like behavior, appeared to be far more prevalent in dogs that were castrated and spayed at a younger age, rather than those that were allowed to mature naturally before attempting this operation.

As behavioural consultants and obedience trainers, I find that we are treating many more cases where dogs are displaying (paedomorphic) tendencies. That is puppy like behaviour's in adult dogs, which I believe is related to the incidence of early spaying and neutering.

I also observed that bitches spayed too early, may be far more interesting to intact males; unwanted male attention can cause the female to become aggressive and protective of this attention in adulthood.

I asked the members of PAACT
"The Professional Association of Applied Canine Trainers"
to start to monitor the dogs they were treating and to record the time they were spayed and neutered. Their feedback appeared to bear out my initial findings.

When should we spay and neuter?

With regard to neutering, I believe that males should not be castrated until they have been cocking their leg for at least one month, and should be at least 10 to 27 months of age (depending on size and breed). The larger the breed then the later they mature,. therefore something like a German Shepherd would be much later than the 10 months stated. Probably more like 17 months. Unless of course there are medical or serious behavioural issues to take into consideration.

In females, I believe that they should have at least one season; but preferably two, then wait approximately 3 months after the season before considering spaying, allowing the internal organs to settle down after the season.

Aggression

It has also been observed that young female dogs that show aggressive tendencies towards owners, especially before the age of six months; often demonstrate increased aggression after spaying.

Spaying removes the production of progesterone, which is a natural calming hormone and a Serotonin uplifter. Spaying may therefore escalate any observable aggressive behavior, either to humans or other dogs.

Despite popular belief spaying does not calm a female dog down. It may help to calm certain behaviors in males, but not female dogs. How could it when you are removing hormones that raise serotonin?

Many vets and rescue centre's will neuter a male dog before they have cocked their leg. It is at this point dogs start to seriously mark territory. Not the half-hearted attempts we see in immature dogs. The immature castrated dog may squat for the remainder of its life, and may be more interesting to intact males.

There appears to be a testosterone surge at between 10 and 24 months depending on breed and size, which clearly turns on a dormant hard-wired program that establishes this cocking behavior. Male dogs also produce Progesterone.

Progesterone and testosterone switches on many of the hard-wired behaviors we see in maturity and are not isolated to just one action, therefore other functions that are not so obvious may be switched on at this time.

These may have social implications and behavioral effects that aid in the development of dogs psychological and physical growth. If we switch these off by neutering or castrating too early, we may be denying the opportunity achieve both mentally and physically the dog's full adult potential.

Progesterone receptors are found in brain cells, in nerve sheaths and in bone cells, In both male and female dogs. indicating that progesterone is involved in their function. It also appears to be involved in a range of other biological activities. Therefore neutering before both physical and psychological maturity may have numerous other long-term detrimental effects.

Many dogs that have been neutered early, appear to retain far more juvenile characteristics than those neutered when mature. In other words, they retain perpetual puppy like characteristics, whilst this may appear to be initially endearing, who would really want a dog that shows low concentration levels and frustrated puppy like behaviour for the remainder of its adult life?

Can it also cause physiological problems?

Because early neutering removes sex hormones, this delays maturation of "osteoclasts" resulting in the delayed closing of the growth plates of the long leg bones creating leggy taller than average dogs, thereby increasing the risk of some orthopedic disorders such as cruciate ligament disease, Hip problems and possibly bone cancer.

It was long believed that eunuchs (castrated humans) were castrated to stop them being interested in the ladies of the Harem. However they were also used as palace guards, because of the affect neutering has on the “osteoclasts” these eunuch's were therefore appreciably taller, making them more imposing as guards and soldiers.

It has been observed that Spaying can significantly increase the risk of urinary incontinence in bitches. Early neutering also increases risk of urethral sphincter incontinence in males (A. Aaron et al., Vet Rec. 139:542-6, 1996.)

In conclusion, I am all for neutering, but at the right time, thereby allowing your dogs to reach full maturity in both body and mind. I believe that a full psychological and physiological set of tests and experiments should be scientifically undertaken, to study the effect of early castration and spaying on all our animals, not just dogs and cats.

These findings though purely observational, have also been borne out by observation and experiences of behaviorists and trainers who are members of PAACT “The Professional Association of Applied Canine Trainers” An organisation dedicated to enhancing and bringing together the two main canine disciplines of obedience training and behavioural therapy. It is PAACT’s belief that to be able to work with dogs on a professional level, you need to be versed in both of these disciplines.

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This is a Peer reviewed look at the pro's and cons of Spaying and Neutering and is worth a read Please [CLICK HERE](#) for the review

Further information

Exact figures for the UK are uncertain, but it is generally accepted that there are around seven million dogs and nine million cats, which is a 5-year upward spiral for the cats and a slight decline in the number of dogs. This reflects out changing lifestyle with the trend for smaller housing, staying single and both adults fully employed, this would tend to make a cat an easier option.

Approximately 135,000 stray dogs per annum are picked up in the UK . 400 are destroyed every week. In the USA the figures are very different, they have almost 70 million dogs almost twice as many per household as the UK. 8 million to 12 million dogs and cats are euthanised annually. It has been suggested that only 50% of all dogs born in the USA will survive to see their second birthday. This is not because they are not caring or loving owners, but simply because they have no organised program for neutering and spaying.

The USA has many more latchkey dogs than the UK , therefore creating far more unwanted pregnancies. Left to there own devices. two dogs and their offspring can produce 67,000 young over a 6-year period. Two cats and their offspring can produce 420,000 over a 7-year period.

As a practicing behaviourist and obedience trainer, I am often called to discuss whether the owners should spay or neuter. I find in general that my male clients (the human ones) get a pained expression and cross their legs in agitation when the subject of castration arises. They generally have no problem with spaying; it is the castration that causes the concern. Yet the opposite is true from my female clients. Who often tell me that their husbands will not entertain their dog being emasculated. yet they have no problem with the concept.

The Effects of Spaying and Neutering on Canine Behavior

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Males

Neutering the male dog removes the source of circulating testosterone.

"Ben and Hart"at the University of California carried out the most extensive surveys on the effects of castration on dogs and came up with these statistics:

Roaming

Reduced in 90% of cases

Rapid reduction in 45%

Gradual reduction in 45%

No effect in 10%

Intermale Aggression

Reduced in 60% of cases
Rapid reduction in 25%
Gradual reduction in 35%
No effect in 40%

Mounting People

Reduced in 60% of cases
Rapid reduction in 30%
Gradual reduction in 30%
Some decline in mounting bitches in heat too

Urine Marking in the House

Reduced in 50% of cases
Rapid reduction in 20%
Gradual reduction in 30%" (Fogle, 1990, p. 53)

Testosterone has the effect of modulating sexually dimorphic behaviors as well as aggressive or reactive behaviors. "Testosterone acts as a modulator that makes dogs react more intensely. When an intact dog decides to react to something, he reacts more quickly, with greater intensity, and for a longer period of time." (Overall, 1997, p.96)

There is a two fold explanation of the effects of androgens (specifically testosterone) upon behavior which bear upon the affects of castration and behavior: 1) prenatal androgenization of the testosterone sensitive neural substrate which mediate sexual and aggressive behavior and 2) reinforcement and sensitization of these substrates once they have been realized at puberty (Lindsay, 2000, p.186). This is supported by the finding that testosterone can create male sexually dimorphic behaviors when injected into females, and, that male sexually dimorphic behaviors are not eliminated upon castration, even prepubertally.

There are two significant surges of testosterone in the male canine system; one just before and just after birth, which masculinizes the brain and essentially sets up the potential for associated behaviors, and another at puberty, which further modulates these behaviors. Thereafter the behaviors take on more of a learned component. This first androgenizing effect is not affected by castration, which explains the inconclusive results of castration upon behavior. I would be remiss not to add into this discussion the high likelihood that many male sexually dimorphic behaviors may be modal action patters to some degree. Male urine marking for example is probably a modal action pattern, as is mounting. Roaming is probably instinctive also. As with most canine behaviors it always comes down to a complex amalgam of genetics and learning. Hormonal activity can be affected by neutering but genetics can only be affected in populations (as opposed to individuals). Behaviors that are highly instinctive are difficult to effect with training.

"Testosterone titers start to rise by the time the male pup reaches 4 to 5 months, where after testosterone levels reach a maximum at 10 months of age and then fall to adult male levels by 18 months of age." (Dunbar, 1999, p.68) Raising testosterone levels at 4 to 5 months of age may be important in provoking other dogs to target them so that they will learn affiliative behaviors

(Dunbar, 1999, p.68). On the other hand as circulating testosterone levels increase associated behaviors become more learned and entrenched in the behavioral repertoire of the dog. This argues for neutering to be done at 6 months of age in order that affiliative behaviors may be learned through the targeting phenomenon but so that affects of circulating testosterone are not present long enough to cause significant reinforcement histories for associated behaviors. One argument is that dogs who are expected to live with or otherwise interact with other dogs throughout their lives and who are also extra sensitive should be neutered early (say at 4 months) so that they are not targeted quite so heavily by other dogs. Waiting with these dogs can provoke interactions that lead to classical conditioning complications. If a dog is provoked to engage in intermale aggression for example, he may learn from his interactions to anticipate a confrontation. This classical conditioning effect can influence the dog's behavior long after circulating testosterone is removed from the body. This beneficial effect must be weighed against the potentially negative ramifications of prepubertal neutering. Prepubertally neutered dogs show a significant increase in excitability and general activity level (Lindsay, 2000, p.186). For some breeds and some owners this may not be a problem and prepubertal neutering may prevent otherwise difficult to avoid traumatic experiences with other dogs while allowing for maximal socialization. A cost benefit assessment must be made in each case before the timing of neutering can be advised upon. It is also often suggested that puppies who show dominance or high levels of controlling behaviors be neutered early. This may not be based on any valid research. "... prepubertal castration appears to have no effect on the development of canine aggression in males (Le Boeuf, 1970)." (Overall, 1997, p.97)

Females

Spaying of the female dog removes the source of estrogen and progesterone. Estrogen and progesterone are increased or decreased in cycles. The biggest influence cycling fluctuations in estrogen and progesterones have on female dog behavior is pregnancy related problems.

"While estrogen increases in the dog's body for a short length of time, progesterone remains in circulation, influencing the brain for two months after each estrous and can have a dramatic effect on canine behavior. The most common behaviors are those associated with pregnancy, nest building, guarding possessions and milk production." (Fogle, 1990, p.54)

The most notable problem arises when the dog guards items maternally. Other problems can involve irritability, conflict with other dogs and energy reduction. "Guarding toys, dolls, rags, slippers or anything else that can be carried is another common behavioral consequence of the surge in progesterone." (Fogle, 1990, p.55) Possessive guarding in intact females that occurs in cycles is usually a hormonal guarding of the type described.

Female dogs are at increased risk of disease if they are allowed to experience their first heat. For this reason it is often suggested that a female dog be spayed prior to 6 months of age. It would appear that dogs who demonstrate control complex aggression (aka dominance aggression) toward owners prior to 6 months of age are at risk for becoming more aggressive after ovariectomy. If a dog demonstrates a significant propensity to control complex aggression it may be wise to avoid spaying these dogs.

"When the female dogs neutered at or after puberty were compared to intact controls, several differences were noted. One difference was a significantly greater tendency for dominance aggression to be shown toward family members by the neutered females. What is not clear about the study is whether the surgery was performed in more of these dogs because aggression had already been identified as a problem, or whether there is a direct cause-effect relation. Ovariohysterectomized bitches also showed significantly more excitement in the car and less discriminate appetite than did the intact ones, even immediately post surgery." (Beaver, 1999, p.229)

These observations are backed by Fogle, (p. 56) and Overall (p. 97). It remains unclear exactly why some undesirable behavioral side effects occur. Inconclusive evidence exists that androgens may be implicated in dominance aggression in females (Overall, 1997, p.97). Experiments performed on hamsters (Brain & Haug, 1992; Vom Saal, 1984, 1989, as cited in Overall, 1997, p.98) suggest that females positioned in the uterus between two males will be more aggressive than other females and this conflict behavior more resembles male conflict behavior. We know that the male brain is exposed to testosterone prior to birth, which masculinizes the male brain. It is theorized that this masculinizing of bystander females results in aggression in females, again adding to the debate of how important testosterone is in the development of aggression and other behaviors. Animals experimentally injected with testosterone, including females, tend to take on male sexually dimorphic behaviors. It would seem that testosterone may turn out to be very important one way or another in the development of aggressive behavior.

In Conclusion

Neutering can remove one of the influences upon male sexually dimorphic behavior and aggression and while this cannot be considered curative it may help prevent associated behaviors or reduce the modulating effect of associated behaviors that already exist. Timing of neutering may be significant and should be advised upon with a cost benefit assessment on a case-by-case basis.

Spaying will prevent the cycling of estrogen and progesterone, which may prevent associated behaviors. Whether to spay or not should be advised on a case by case basis depending on the presence or absence of significant excessively controlling aggressive behaviors toward owners prior to six months of age.

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More articles by James O'Heare can be found at Dog Psychology

One thing is clear – much of the spay/neuter information that is available to the public is unbalanced and contains claims that are exaggerated or unsupported by evidence. Rather than helping to educate pet owners, much of it has contributed to common misunderstandings about the health risks and benefits associated of spay/neuter in dogs.

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INTRODUCTION

Dog owners in America are frequently advised to spay/neuter their dogs for health reasons. A number of health benefits are cited, yet evidence is usually not cited to support the alleged health benefits.

When discussing the health impacts of spay/neuter, health risks are often not mentioned. At times, some risks are mentioned, but the most severe risks usually are not.

This article is an attempt to summarize the long-term health risks and benefits associated with spay/neuter in dogs that can be found in the veterinary medical literature. This article will not discuss the impact of spay/neuter on population control, or the impact of spay/neuter on behavior.

Nearly all of the health risks and benefits summarized in this article are findings from retrospective epidemiological research studies of dogs, which examine potential associations by looking backwards in time. A few are from prospective research studies, which examine potential associations by looking forward in time.

SUMMARY

An objective reading of the veterinary medical literature reveals a complex situation with respect to the long-term health risks and benefits associated with spay/neuter in dogs. The evidence shows that spay/neuter correlates with both positive AND adverse health effects in dogs. It also suggests how much we really do not yet understand about this subject.

On balance, it appears that no compelling case can be made for neutering most male dogs, especially immature male dogs, in order to prevent future health problems. The number of health problems associated with neutering may exceed the associated health benefits in most cases.

On the positive side, neutering male dogs

- eliminates the small risk (probably <1%) of dying from testicular cancer
- reduces the risk of non-cancerous prostate disorders
- reduces the risk of perianal fistulas
- may possibly reduce the risk of diabetes (data inconclusive)

On the negative side, neutering male dogs

- if done before 1 year of age, significantly increases the risk of osteosarcoma (bone cancer); this is a common cancer in medium/large and larger breeds with a poor prognosis.
- increases the risk of cardiac hemangiosarcoma by a factor of 1.6
- triples the risk of hypothyroidism
- increases the risk of progressive geriatric cognitive impairment
- triples the risk of obesity, a common health problem in dogs with many associated health problems
- quadruples the small risk (<0.6%) of prostate cancer
- doubles the small risk (<1%) of urinary tract cancers
- increases the risk of orthopedic disorders
- increases the risk of adverse reactions to vaccinations

For female dogs, the situation is more complex. The number of health benefits associated with spaying may exceed the associated health problems in some (not all) cases. On balance, whether spaying improves the odds of overall good health or degrades them probably depends on the age of the female dog and the relative risk of various diseases in the different breeds.

On the positive side, spaying female dogs

- if done before 2.5 years of age, greatly reduces the risk of mammary tumors, the most common malignant tumors in female dogs
- nearly eliminates the risk of pyometra, which otherwise would affect about 23% of intact female dogs; pyometra kills about 1% of intact female dogs
- reduces the risk of perianal fistulas
- removes the very small risk ($\leq 0.5\%$) from uterine, cervical, and ovarian tumors

On the negative side, spaying female dogs

- if done before 1 year of age, significantly increases the risk of osteosarcoma (bone cancer); this is a common cancer in larger breeds with a poor prognosis
- increases the risk of splenic hemangiosarcoma by a factor of 2.2 and cardiac hemangiosarcoma by a factor of >5 ; this is a common cancer and major cause of death in some breeds
- triples the risk of hypothyroidism
- increases the risk of obesity by a factor of 1.6-2, a common health problem in dogs with many associated health problems
- causes urinary “spay incontinence” in 4-20% of female dogs
- increases the risk of persistent or recurring urinary tract infections by a factor of 3-4
- increases the risk of recessed vulva, vaginal dermatitis, and vaginitis, especially for female dogs spayed before puberty
- doubles the small risk ($<1\%$) of urinary tract tumors
- increases the risk of orthopedic disorders
- increases the risk of adverse reactions to vaccinations

One thing is clear – much of the spay/neuter information that is available to the public is unbalanced and contains claims that are exaggerated or unsupported by evidence. Rather than helping to educate pet

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owners, much of it has contributed to common misunderstandings about the health risks and benefits associated of spay/neuter in dogs.

The traditional spay/neuter age of six months as well as the modern practice of pediatric spay/neuter appear to predispose dogs to health risks that could otherwise be avoided by waiting until the dog is physically mature, or perhaps in the case of many male dogs, foregoing it altogether unless medically necessary.

The balance of long-term health risks and benefits of spay/neuter will vary from one dog to the next. Breed, age, and gender are variables that must be taken into consideration in conjunction with non-medical factors for each individual dog. Across-the-board recommendations for all pet dogs do not appear to be supportable from findings in the veterinary medical literature.

FINDINGS FROM STUDIES

This section summarizes the diseases or conditions that have been studied with respect to spay/neuter in dogs.

Complications from Spay/Neuter Surgery

All surgery incurs some risk of complications, including adverse reactions to anesthesia, hemorrhage, inflammation, infection, etc. Complications include only immediate and near term impacts that are clearly linked to the surgery, not to longer term impacts that can only be assessed by research studies.

At one veterinary teaching hospital where complications were tracked, the rates of intraoperative, postoperative and total complications were 6.3%, 14.1% and 20.6%, respectively as a result of spaying female dogs¹. Other studies found a rate of total complications from spaying of 17.7%² and 23%³. A study of Canadian veterinary private practitioners found complication rates of 22% and 19% for spaying female dogs and neutering male dogs, respectively⁴.

Serious complications such as infections, abscesses, rupture of the surgical wound, and chewed out sutures were reported at a 1- 4% frequency, with spay and castration surgeries accounting for 90% and 10% of these complications, respectively.⁴

The death rate due to complications from spay/neuter is low, at around 0.1%².

Prostate Cancer

Much of the spay/neuter information available to the public asserts that neutering will reduce or eliminate the risk that male dogs develop prostate cancer. This would not be an unreasonable assumption, given that prostate cancer in humans is linked to testosterone. But the evidence in dogs does not support this claim. In fact, the strongest evidence suggests just the opposite.

There have been several conflicting epidemiological studies over the years that found either an increased risk or a decreased risk of prostate cancer in neutered dogs. These studies did not utilize control populations, rendering these results at best difficult to interpret. This may partially explain the conflicting results.

More recently, two retrospective studies were conducted that did utilize control populations. One of these studies involved a dog population in Europe⁵ and the other involved a dog population in America⁶. Both studies found that neutered male dogs have a four times higher risk of prostate cancer than intact dogs.

Based on their results, the researchers suggest a cause-and-effect relationship: “this suggests that castration does not initiate the development of prostatic carcinoma in the dog, but does favor tumor progression”⁵ and also “Our study found that most canine prostate cancers are of ductal/urothelial origin....The relatively low incidence of prostate cancer in intact dogs may suggest that testicular hormones are in fact protective against ductal/urothelial prostatic carcinoma, or may have indirect effects on cancer development by changing the environment in the prostate.”⁶

This needs to be put in perspective. Unlike the situation in humans, prostate cancer is uncommon in dogs. Given an incidence of prostate cancer in dogs of less than 0.6% from necropsy studies⁷, it is difficult to see that the risk of prostate cancer should factor heavily into most neutering decisions. There is evidence for an increased risk of prostate cancer in at least one breed (Bouviere)⁵, though very little data so far to guide us in regards to other breeds.

Testicular Cancer

Since the testicles are removed with neutering, castration removes any risk of testicular cancer (assuming the castration is done before cancer develops). This needs to be compared to the risk of testicular cancer in intact dogs.

Testicular tumors are not uncommon in older intact dogs, with a reported incidence of 7%⁸. However, the prognosis for treating testicular tumors is very good owing to a low rate of metastasis⁹, so testicular cancer is an uncommon cause of death in intact dogs. For example, in a Purdue University breed health survey of Golden Retrievers¹⁰, deaths due to testicular cancer were sufficiently infrequent that they did not appear on list of significant causes of "Years of Potential Life Lost for Veterinary Confirmed Cause of Death" even though 40% of GR males were intact. Furthermore, the GRs who were treated for testicular tumors had a 90.9% cure rate. This agrees well with other work that found 6-14% rates of metastasis for testicular tumors in dogs¹¹.

The high cure rate of testicular tumors combined with their frequency suggests that fewer than 1% of intact male dogs will die of testicular cancer.

In summary, though it may be the most common reason why many advocate neutering young male dogs, the risk from life threatening testicular cancer is sufficiently low that neutering most male dogs to prevent it is difficult to justify.

An exception might be bilateral or unilateral cryptorchids, as testicles that are retained in the abdomen are 13.6 times more likely to develop tumors than descended testicles¹² and it is also more difficult to detect tumors in undescended testicles by routine physical examination.

Osteosarcoma (Bone Cancer)

A multi-breed case-control study of the risk factors for osteosarcoma found that spay/neutered

dogs (males or females) had twice the risk of developing osteosarcoma as did intact dogs¹³.

This risk was further studied in Rottweilers, a breed with a relatively high risk of osteosarcoma. This retrospective cohort study broke the risk down by age at spay/neuter, and found that the elevated risk of osteosarcoma is associated with spay/neuter of young dogs¹⁴. Rottweilers spayed/neutered before one year of age were 3.8 (males) or 3.1 (females) times more likely to develop osteosarcoma than intact dogs. Indeed, the combination of breed risk and early spay/neuter meant that Rottweilers spayed/neutered before one year of age had a 28.4% (males) and 25.1% (females) risk of developing osteosarcoma. These results are consistent with the earlier multi-breed study¹³ but have an advantage of assessing risk as a function of age at neuter. A logical conclusion derived from combining the findings of these two studies is that spay/neuter of dogs before 1 year of age is associated with a significantly increased risk of osteosarcoma.

The researchers suggest a cause-and-effect relationship, as sex hormones are known to influence the maintenance of skeletal structure and mass, and also because their findings showed an inverse relationship between time of exposure to sex hormones and risk of osteosarcoma.¹⁴

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The risk of osteosarcoma increases with increasing breed size and especially height¹³. It is a common cause of death in medium/large, large, and giant breeds. Osteosarcoma is the third most common cause of death in Golden Retrievers¹⁰ and is even more common in larger breeds¹³.

Given the poor prognosis of osteosarcoma and its frequency in many breeds, spay/neuter of immature dogs in the medium/large, large, and giant breeds is apparently associated with a significant and elevated risk of death due to osteosarcoma.

Mammary Cancer (Breast Cancer)

Mammary tumors are by far the most common tumors in intact female dogs, constituting some 53% of all

malignant tumors in female dogs in a study of dogs in Norway¹⁵ where spaying is much less common than in the USA.

50-60% of mammary tumors are malignant, for which there is a significant risk of metastasis¹⁶. Mammary tumors in dogs have been found to have estrogen receptors¹⁷, and the published research¹⁸ shows that the relative risk (odds ratio) that a female will develop mammary cancer compared to the risk in intact females is dependent on how many estrus cycles she experiences:

# of estrus cycles before spay	Odds Ratio
None	0.005
1	0.08
2 or more	0.26
Intact	1.00

The same data when categorized differently showed that the relative risk (odds ratio) that females will develop mammary cancer compared to the risk in intact females indicated that:

Age at Spaying	Odds Ratio
≤ 29 months	0.06
≥ 30 months	0.40 (not statistically significant at the P<0.05 level)
Intact	1.00

Please note that these are RELATIVE risks. This study has been referenced elsewhere many times but the results have often been misrepresented as absolute risks.

A similar reduction in breast cancer risk was found for women under the age of 40 who lost their estrogen production due to “artificial menopause”¹⁹ and breast cancer in humans is known to be estrogen activated.

Mammary cancer was found to be the 10th most common cause of years of lost life in Golden Retrievers, even though 86% of female GRs were spayed, at a median age of 3.4 yrs¹⁰. Considering that the female subset accounts for almost all mammary cancer cases, it probably would rank at about the 5th most common cause of years of lost life in female GRs. It would rank higher still if more female GRs had been kept intact up to 30 months of age.

Boxers, cocker spaniels, English Springer spaniels, and dachshunds are breeds at high risk of mammary tumors¹⁵. A population of mostly intact female Boxers was found to have a 40% chance of developing mammary cancer between the ages of 6-12 years of age¹⁵. There are some indications that purebred dogs may be at higher risk than mixed breed dogs, and purebred dogs with high inbreeding coefficients may be at higher risk than those with low inbreeding coefficients²⁰. More investigation is required to determine if these are significant.

In summary, spaying female dogs significantly reduces the risk of mammary cancer (a common cancer), and the fewer estrus cycles experienced at least up to 30 months of age, the lower the risk will be.

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Female Reproductive Tract Cancer (Uterine, Cervical, and Ovarian Cancers)

Uterine/cervical tumors are rare in dogs, constituting just 0.3% of tumors in dogs²¹.

Spaying will remove the risk of ovarian tumors, but the risk is only 0.5%²².

While spaying will remove the risk of reproductive tract tumors, it is unlikely that surgery can be justified to prevent the risks of uterine, cervical, and ovarian cancers as the risks are so low.

Urinary Tract Cancer (Bladder and Urethra Cancers)

An age-matched retrospective study found that spay/neuter dogs were two times more likely to develop lower urinary tract tumors (bladder or urethra) compared to intact dogs²³. These tumors are nearly always malignant, but are infrequent, accounting for less than 1% of canine tumors. So this risk is unlikely to weigh heavily on spay/neuter decisions.

Airedales, Beagles, and Scottish Terriers are at elevated risk for urinary tract cancer while German Shepherds have a lower than average risk²³.

Hemangiosarcoma

Hemangiosarcoma is a common cancer in dogs. It is a major cause of death in some breeds, such as Salukis, French Bulldogs, Irish Water Spaniels, Flat Coated Retrievers, Golden Retrievers, Boxers, Afghan Hounds, English Setters, Scottish Terriers, Boston Terriers, Bulldogs, and German Shepherd Dogs²⁴.

In an aged-matched case controlled study, spayed females were found to have a 2.2 times higher risk of splenic hemangiosarcoma compared to intact females²⁴.

A retrospective study of cardiac hemangiosarcoma risk factors found a >5 times greater risk in spayed female dogs compared to intact female dogs and a 1.6 times higher risk in neutered male dogs compared to intact male dogs.²⁵ The authors suggest a protective effect of sex hormones against hemangiosarcoma, especially in females.

In breeds where hemangiosarcoma is an important cause of death, the increased risk associated with spay/neuter is likely one that should factor into decisions on whether or when to sterilize a dog.

Hypothyroidism

Spay/neuter in dogs was found to be correlated with a three fold increased risk of hypothyroidism compared to intact dogs. ²⁶.

The researchers suggest a cause-and-effect relationship: They wrote: “More important [than the mild direct impact on thyroid function] in the association between [spaying and] neutering and hypothyroidism may be the effect of sex hormones on the immune system. Castration increases the severity of autoimmune thyroiditis in mice” which may explain the link between spay/neuter and hypothyroidism in dogs.

Hypothyroidism in dogs causes obesity, lethargy, hair loss, and reproductive abnormalities.²⁷

The lifetime risk of hypothyroidism in breed health surveys was found to be 1 in 4 in Golden Retrievers¹⁰, 1 in 3 in Akitas²⁸, and 1 in 13 in Great Danes²⁹.

Owing to changes in metabolism, spay/neuter dogs are more likely to be overweight or obese than intact dogs. One study found a two fold increased risk of obesity in spayed females compared to intact females³⁰.

Another study found that spay/neuter dogs were 1.6 (females) or 3.0 (males) times more likely to be obese than intact dogs, and 1.2 (females) or 1.5 (males) times more likely to be overweight than intact dogs³¹.

A survey study of veterinary practices in the UK found that 21% of dogs were obese.³⁰

Being obese and/or overweight is associated with a host of health problems in dogs. Overweight dogs are more likely to be diagnosed with hyperadrenocorticism, ruptured cruciate ligament, hypothyroidism, lower urinary tract disease, and oral disease³². Obese dogs are more likely to be diagnosed with hypothyroidism, diabetes mellitus, pancreatitis, ruptured cruciate ligament, and neoplasia (tumors)³².

Diabetes

Some data indicate that neutering doubles the risk of diabetes in male dogs, but other data showed no significant change in diabetes risk with neutering³³. In the same studies, no association was found between spaying and the risk of diabetes.

Adverse Vaccine Reactions

A retrospective cohort study of adverse vaccine reactions in dogs was conducted, which included allergic reactions, hives, anaphylaxis, cardiac arrest, cardiovascular shock, and sudden death. Adverse reactions were 30% more likely in spayed females than intact females, and 27% more likely in neutered males than intact males³⁴.

The investigators discuss possible cause-and-effect mechanisms for this finding, including the roles that sex hormones play in body's ability to mount an immune response to vaccination.³⁴

Toy breeds and smaller breeds are at elevated risk of adverse vaccine reactions, as are Boxers, English Bulldogs, Lhasa Apsos, Weimaraners, American Eskimo Dogs, Golden Retrievers, Basset Hounds, Welsh Corgis, Siberian Huskies, Great Danes, Labrador Retrievers, Doberman Pinschers, American Pit Bull Terriers, and Akitas.³⁴ Mixed breed dogs were found to be at lower risk, and the authors suggest genetic heterogeneity (hybrid vigor) as the cause.

Urogenital Disorders

Urinary incontinence is common in spayed female dogs, which can occur soon after spay surgery or after a delay of up to several years. The incidence rate in various studies is 4-20%^{35,36,37} for spayed females compared to only 0.3% in intact females³⁸. Urinary incontinence is so strongly linked to spaying that it is commonly called “spay incontinence” and is caused by urethral sphincter incompetence³⁹, though the biological mechanism is unknown. Most (but not all) cases of urinary incontinence respond to medical treatment, and in many cases this treatment needs to be continued for the duration of the dog’s life.⁴⁰

A retrospective study found that persistent or recurring urinary tract (bladder) infections (UTIs) were 3-4 times more likely in spayed female dogs than in intact females⁴¹. Another retrospective study found that female dogs spayed before 5 1/2 months of age were 2.76 times more likely to develop UTIs compared to those spayed after 5 1/2 months of age.⁴²

Depending on the age of surgery, spaying causes abnormal development of the external genitalia. Spayed females were found to have an increased risk of recessed vulva, vaginal dermatitis, vaginitis, and UTIs.⁴³ The risk is higher still for female dogs spayed before puberty.⁴³

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Pyometra (Infection of the Uterus)

Pet insurance data in Sweden (where spaying is very uncommon) found that 23% of all female

dogs

developed pyometra before 10 years of age⁴⁴. Bernese Mountain dogs, Rottweilers, rough-haired Collies,

Cavalier King Charles Spaniels and Golden Retrievers were found to be high risk breeds⁴⁴.

Female dogs

that have not whelped puppies are at elevated risk for pyometra⁴⁵. Rarely, spayed female dogs can

develop “stump pyometra” related to incomplete removal of the uterus.

Pyometra can usually be treated surgically or medically, but 4% of pyometra cases led to death⁴⁴.

Combined with the incidence of pyometra, this suggests that about 1% of intact female dogs will die from

pyometra.

Perianal Fistulas

Male dogs are twice as likely to develop perianal fistulas as females, and spay/neutered dogs have a

decreased risk compared to intact dogs⁴⁶.

German Shepherd Dogs and Irish Setters are more likely to develop perianal fistulas than are other

breeds.⁴⁶

Non-cancerous Disorders of the Prostate Gland

The incidence of benign prostatic hypertrophy (BPH, enlarged prostate) increases with age in intact male

dogs, and occurs in more than 80% of intact male dogs older than the age of 5 years⁴⁷. Most cases of BPH

cause no problems, but in some cases the dog will have difficulty defecating or urinating.

Neutering will prevent BPH. If neutering is done after the prostate has become enlarged, the enlarged

prostate will shrink relatively quickly.

BPH is linked to other problems of the prostate gland, including infections, abscesses, and cysts, which can

sometimes have serious consequences.

Orthopedic Disorders

In a study of beagles, surgical removal of the ovaries (as happens in spaying) caused an increase in the rate of remodeling of the ilium (pelvic bone)⁴⁸, suggesting an increased risk of hip dysplasia with spaying. Spaying was also found to cause a net loss of bone mass in the spine ⁴⁹.

Spay/neuter of immature dogs delays the closure of the growth plates in bones that are still growing, causing those bones to end up significantly longer than in intact dogs or those spay/neutered after maturity⁵⁰. Since the growth plates in various bones close at different times, spay/neuter that is done after some growth plates have closed but before other growth plates have closed might result in a dog with unnatural proportions, possibly impacting performance and long term durability of the joints.

Spay/neuter is associated with a two fold increased risk of cranial cruciate ligament rupture⁵¹. Perhaps this is associated with the increased risk of obesity³⁰.

Spay/neuter before 5 1/2 months of age is associated with a 70% increased aged-adjusted risk of hip dysplasia compared to dogs spayed/neutered after 5 1/2 months of age, though there were some indications that the former may have had a lower severity manifestation of the disease⁴². The researchers suggest “it is possible that the increase in bone length that results from early-age gonadectomy results in changes in joint conformation, which could lead to a diagnosis of hip dysplasia.”

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In a breed health survey study of Airedales, spay/neuter dogs were significantly more likely to suffer hip dysplasia as well as “any musculoskeletal disorder”, compared to intact dogs⁵², however possible confounding factors were not controlled for, such as the possibility that some dogs might have been spayed/neutered because they had hip dysplasia or other musculoskeletal disorders.

Compared to intact dogs, another study found that dogs neutered six months prior to a diagnosis of hip dysplasia were 1.5 times as likely to develop clinical hip dysplasia.⁵³

Compared to intact dogs, spayed/neutered dogs were found to have a 3.1 fold higher risk of patellar luxation.⁵⁴

Geriatric Cognitive Impairment

Neutered male dogs and spayed female dogs are at increased risk of progressing from mild to severe geriatric cognitive impairment compared to intact male dogs⁵⁵. There weren't enough intact geriatric females available for the study to determine their risk.

Geriatric cognitive impairment includes disorientation in the house or outdoors, changes in social interactions with human family members, loss of house training, and changes in the sleep-wake cycle⁵⁵.

The investigators state "This finding is in line with current research on the neuro-protective roles of testosterone and estrogen at the cellular level and the role of estrogen in preventing Alzheimer's disease in human females. One would predict that estrogens would have a similar protective role in the sexually intact female dogs; unfortunately too few sexually intact female dogs were available for inclusion in the present study to test the hypothesis"⁵⁵

CONCLUSIONS

An objective reading of the veterinary medical literature reveals a complex situation with respect to the long-term health risks and benefits associated with spay/neuter in dogs. The evidence shows that spay/neuter correlates with both positive AND adverse health effects in dogs. It also suggests how much we really do not yet understand about this subject.

On balance, it appears that no compelling case can be made for neutering most male dogs to prevent future health problems, especially immature male dogs. The number of health problems associated with neutering may exceed the associated health benefits in most cases.

For female dogs, the situation is more complex. The number of health benefits associated with spaying may exceed the associated health problems in many (not all) cases. On balance, whether spaying improves the odds of overall good health or degrades them probably depends on the age of the dog and the relative risk

of various diseases in the different breeds.

The traditional spay/neuter age of six months as well as the modern practice of pediatric spay/neuter appear to predispose dogs to health risks that could otherwise be avoided by waiting until the dog is physically mature, or perhaps in the case of many male dogs, foregoing it altogether unless medically necessary.

The balance of long-term health risks and benefits of spay/neuter will vary from one dog to the next. Breed, age, and gender are variables that must be taken into consideration in conjunction with non-medical factors for each individual dog. Across-the-board recommendations for all dogs do not appear to be supportable from findings in the veterinary medical literature.

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Even another study!!!.....

EARLY SPAYING AND NEUTERING, AND THE

DANGERS THAT CAN BE INVOLVED ! Learn the truth !!!! Bone cancer is one danger, and females having incontinence problems is another...LEARN before you buy....if you purchase a puppy that has been spayed or neutered at the tender age of 7-8 weeks of age, you are asking for trouble...read on.....

(written by Pam Davol, a noted research scientist and a genetic expert)

Owners who are considering neutering need to take all factors into consideration, not simply the benefits of neutering when making a decision as to when to neuter.

If one looks close enough, one will find that neutering is one of those topics in veterinary medicine that is extremely biased: that is, most often one will find more emphasis placed on the pros of neutering with more often than not, very little or no discussion of the cons. Veterinarians, and responsible breeders as well, face a true dilemma when discussing neutering. The overpopulation crisis presents a very real concern with regard to the necessity of ownership responsibility. Prepubertal/early neutering or required neutering provides a means for vets/breeders to enforce owner responsibility by ensuring surgical sterilization of dogs not destined to be used in breeding programs. Again, this enforced neutering is typically presented along with a preamble of all the benefits that go along with neutering. However, I believe that breeders, if not veterinarians, need to begin questioning the ethics of this approach to prompt or require owners to neuter; especially in light of the facts that early neutering may not be as benign a process to the health of a dog as one would believe.

Yes, neutering prior to the beginning of estrus does reduce risk for mammary cancer in females, but it also significantly increases risk for urinary incontinence in bitches which predisposes these

bitches to diethylstilbestrol (DES) dependency (Stocklin-Gautschi et al., J. Reprod. Fertile. Suppl. 57:233-6, 2001 and many other references)--in some instances, DES is not effective at controlling incontinence and will force some owners to elect euthanasia. Though with lesser risk compared to females, early neutering also increases risk of urethral sphincter incontinence in males (A. Aaron et al., Vet Rec. 139:542-6, 1996.)

With regard to cancer, spayed females have a 4 times greater risk for developing cardiac hemangiosarcomas (vascular tumors) compared to intact females (neutered males also show a significant increase in risk for these tumors compared to intact males) (Ware and Hysper, J. Vet. Intern. Med. 13:95-103, 1999.). Additionally, both neutered males and females have a 2-fold greater risk for developing bone tumors (osteosarcoma) compared to intact males and females (Ru et al., Vet J. 156:31-9, 1998.).

Some evidence suggests that early neutering may also predispose to endocrine disorders later in life (Panciera DL. J. Am. Vet. Med. Assoc., 204:761-7 1994.). Furthermore, there is also an indication that early neutering (because absence of sex hormones delays maturation of osteoclasts and thus results in delayed closing of the growth plates in the long-bones) may predispose to increased risk for various orthopedic disorders (such as cruciate ligament disease as I had mentioned in a previous post). Also, some evidence suggests that there is a correlation between increased time for growth plate closure and incidence of HD in Labs (Todhunter et al. J. Am. Vet Assoc., 1997).

If one conducted a research of the literature on the detrimental effects on physiological development associated with sex hormone deficiencies during adolescent development in any other species other than the dog and cat, one will find a wealth of literature stressing the importance of sex hormones for sound physiological, endocrine and metabolic development. Additionally, if one examines the scientific research that reports the benefits of early neutering in absence of any side-effects in dogs, one will discover that the methodology of these studies are designed in very specific ways to assure that outcome in neutering is presented in a favorable light (this does not mean that the data is biased, this simply means that the comparisons made do not provide for adequate interpretation of long-term effects of neutering).

In light of this, though it is understandable for vets/breeders to urge dog owners to neuter their pets early with regard to the greater good (i.e. reducing risk of accidental breeding), the physiological soundness of the individual dog should take precedence over any other issues. As such, it is my opinion, based upon the literature that I have reviewed that to reduce risks to physiological soundness, etc, that I am of the personal opinion that dogs should be a minimum of 1 year of age before neutering.

"And in Addition"

To Neuter or not to Neuter...

There are a number of studies that suggest that those of us with canine athletes should be carefully considering our current recommendations to spay or neuter all dogs at 6 months of age or earlier. A study by Salmeri et al in 1991 (Salmeri et al JAVMA 1991;198:1193-1203) found that bitches spayed at 7 weeks were significantly taller than those spayed at 7 months, and that those spayed at at 7 months had significantly delayed closure of the growth plates than those not spayed (or presumably spayed after the growth plates had closed). The sex hormones close the growth plates, so the bones of dogs or bitches neutered or spayed before puberty continue to grow. This growth frequently results in a dog that does not have the same body proportions as he/she was genetically meant to. For example, if the femur is 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 becomes heavier (because it is longer), causing increased stresses on the cranial cruciate ligament. This is confirmed by a recent study showing that spayed and neutered dogs have a higher incidence of CCL rupture (Slauterbeck JR, Pankratz K, Xu KT, Bozeman SC, Hardy DM. Canine ovariohysterectomy and orchiectomy increases the prevalence of ACL injury. Clin Orthop Relat Res. 2004 Dec;(429):301-5).

In addition, a study in 2004 in JAVMA (Spain et al. JAVMA 2004;224:380-387) showed that dogs spayed or neutered before 5 1/2 months had a significantly higher incidence of hip dysplasia than dogs spayed or neutered after 5 1/2 months of age. If I were a breeder, I would be very concerned about this, because it would mean that I might be making incorrect breeding decisions if I were considering the hip status of pups I sold that were spayed or neutered early. Interestingly, this same author also identified an increased incidence of sexual behaviors in males and females that were neutered early.

A number of studies, including the one by Spain referenced above, have shown that there is an increase in the incidence of female urinary incontinence in dogs spayed early. This problem is an inconvenience, and not usually life-threatening, but nonetheless one that requires the dog to be medicated for life.

Yes, there is the concern that there is an increased risk of mammary cancer if a dog has a heat cycle. But it is my observation that fewer canine athletes develop mammary cancer as compared to the number that damage their cranial cruciate ligaments. In addition, only about 50 % of mammary cancers are malignant, and those that are malignant don't metastasize very often, particularly in these days when there is early identification and removal of lumps found on our dogs.

In addition, when considering cancer, there is another study of 3218 dogs that showed that dogs that were neutered before a year of age had a significantly increased chance of developing bone cancer (Cooley DM, Beranek BC, Schlittler DL, Glickman NW, Glickman LT, Waters D, Cancer Epidemiol Biomarkers Prev. 2002 Nov;11(11):1434-40), a cancer that is much more life-threatening than mammary cancer, and which affects both genders.

Finally, in another study, unneutered males were significantly less likely than neutered males to suffer cognitive impairment when they were older (Hart BL. J Am Vet Med Assoc. 2001 Jul 1;219(1):51-6). Females were not evaluated in that study.

For these reasons, I have significant concerns with spaying or neutering dogs before puberty, particularly for the canine athlete. And frankly, if something is more healthy for the canine athlete, would we not also want that for pet dogs as well? I think it is important, therefore, that we assess each situation individually. If a pet dog is going to live with an intelligent, well-informed family that understands the problem of pet overpopulation and can be trusted to keep their dogs under their control at all times and to not breed them, I do not recommend spaying or neutering before 14 months of age.

Here at Shershihtzus we have been asked by many about early spay and neutering. Below is an article copied directly from the AVMA for your information. Here at Shershihtzus, we do not believe in spaying or neutering at a tender and young age, but suggest that you speak with your vet and make a sound decision in looking into all sides of this surgery, along with the appropriate

age to have this done, and also the risks of putting a short nosed dog like a shihtzu under anesthetic at an early age. Two vet opinions might help you in your decision. Although shelters and pounds feel they must spay and neuter at a very early age along with some breeders doing this also, we feel it is a personal decision of the new owners and one that we believe our customers should have the right to make. In purchasing a pup that has had this procedure done at 7-8 weeks of age, it is proven by these articles that this surgery in fact does cause severe problems when they get older. There are enough dogs in shelters and poundsdon't let this be an issue in your dog, as this surgery does cause incontinence..... Feel free to call or email me if you have any questions....I will be happy to chat with you about any of our protocols...

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Long-term risks and benefits of early-age gonadectomy in dogs

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Objective—To evaluate the long-term risks and benefits of early-age gonadectomy, compared with traditional- age gonadectomy, among dogs adopted from a large animal shelter.

Design—Retrospective cohort study.

Animals—1,842 dogs.

Procedure—Dogs underwent gonadectomy and were adopted from an animal shelter before 1 year of age; follow-up was available for as long as 11 years after surgery. Adopters completed a questionnaire about their dogs' behavior and medical history. When possible, the dogs' veterinary records were reviewed. Associations between the occurrence of 56 medical and behavioral conditions and dogs' age at gonadectomy were evaluated.

Results—Among female dogs, early-age gonadectomy was associated with increased rate of cystitis and decreasing age at gonadectomy was associated with increased rate of urinary incontinence. Among male and female dogs with early-age gonadectomy, hip dysplasia, noise phobias, and sexual behaviors were increased, whereas obesity, separation anxiety, escaping behaviors, inappropriate elimination when frightened, and relinquishment for any reason were decreased.

Conclusions and Clinical Relevance—Because early age gonadectomy appears to offer more benefits than risks for male dogs, animal shelters can safely gonadectomize male dogs at a young age and veterinary practitioners should consider recommending routine gonadectomy for client-owned male dogs before the traditional age of 6 to 8 months. For female dogs, however, increased urinary incontinence suggests that delaying gonadectomy until at least 3 months of age may be beneficial. (J Am Vet Med Assoc 2004; 224:380–387)

Early Spay-Neuter Considerations
for the Canine Athlete

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 ovariohysterectomy 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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another study!!!!

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Abstract: **OBJECTIVE:** To evaluate the long-term risks and benefits of early-age gonadectomy, compared with traditional-age gonadectomy, among dogs adopted from a large animal shelter. **DESIGN:** Retrospective cohort study. **ANIMALS:** 1,842 dogs. **PROCEDURE:** Dogs underwent gonadectomy and were adopted from an animal shelter before 1 year of age; follow-up was available for as long as 11 years after surgery. Adopters completed a questionnaire about their dogs' behavior and medical history. When possible, the dogs' veterinary records were reviewed. Associations between the occurrence of 56 medical and behavioral conditions and dogs' age at gonadectomy were evaluated. **RESULTS:** Among female dogs, early-age gonadectomy was associated with increased rate of cystitis and decreasing age at gonadectomy was associated with increased rate of urinary incontinence. Among male and female dogs with early-age gonadectomy, hip dysplasia, noise phobias, and sexual behaviors were increased, whereas obesity, separation anxiety, escaping behaviors, inappropriate elimination when frightened, and relinquishment for any reason were decreased. **CONCLUSIONS AND CLINICAL RELEVANCE:** Because early-age gonadectomy appears to offer more benefits than risks for male dogs, animal shelters can safely gonadectomize male dogs at a young age and veterinary practitioners should consider recommending routine gonadectomy for client-owned male dogs before the traditional age of 6 to 8 months. For female dogs, however, increased urinary incontinence suggests that delaying gonadectomy until at least 3 months of age may be beneficial.

Descriptors: prepubertal gonadectomy, adoption, animal shelter, questionnaire, complications, cystitis, urinary incontinence, behavior, benefits