

## The Risks of Spaying and Castrating Dogs and Bitches

The following is a compilation of studies and observations describing the risks of spaying and castrating dogs and bitches. It is a collection of sources published in peer-reviewed professional journals and other sources written for layman's publications. It is in no particular order of importance and has been collected, sorted, and re-sorted for the past five years, as new studies emerge, and older ones are duplicated in bibliographies. I have given the dates I accessed these materials, because the Internet is so fluid, what is there yesterday might read differently today. I use the word, "castrating", because that is what we are doing to our dogs, as much as if the same surgeries were performed on ourselves.

-- Roberta Pliner

Accessed March 25, 2009:

= = several reasons. Most service dogs ARE neutered but a female service dog that has urinary incontinence may not be able to continue as a service dog because she can't be indoors at businesses, restaurants, hotels, etc. Up to one fourth of all female dogs may suffer from "spay incontinence" as a result of spay procedures (see the Proceedings of the Third International Symposium on Non-Surgical Contraceptive Methods for Pet Population Control (<http://www.acc-d.org/2006%20Proceedings> and also <http://www.naiaonline.org/pdfs/LongTermHealthEffectsOfSpayNeuterInDogs.pdf>).

(The NAIA study is cited below with some of its text.--RP)

Neutered male dogs may have more issues with cancer and long bone problems that may reduce their service life. There is a reason why such service dog organizations as the Canine Companions for Independence opposed AB 1634's neutering requirements. [http://caninecompanions.org/national/in\\_the\\_news.html](http://caninecompanions.org/national/in_the_news.html). Moreover, mandatory spay/neuter does NOT solve shelter issues.

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Accessed: March 21, 2009:

**BAD EFFECTS OF SPAY-NEUTER, IGNORED BY AR EXTREMISTS**  
February 24, 2009 · No Comments

<http://petdefense.wordpress.com/2009/02/24/bad-effects-of-spay-neuterignored-by-ar-extremists/>

Join the Crusade Against HSUS+Anti-Pet Laws+Pass It Forward!—>

A review of over 50-117 studies involving the altering of canines shows that there are major detrimental effects shown involving spaying-neutering – but these are NEVER mentioned by the extremists – instead, they only mention some of the risk reductions such as reducing uterine infections or uterine tumors.

Major risks of altering a canine include the following:

**Decreases life span**

**Increases risk of osteosarcoma (bone cancer)**

**Increases risk of obesity**

**Increases risk of bladder cancer**

**Increases risk of prostatic cancer**

**Increases risk of splenic haemangiosarcoma in spayed bitches**

**Increases risk of cardiac haemangiosarcoma**

**Increases risk of urinary incontinence (bitches/dogs)**

**Increases risk of cholangiocarcinoma (cancer of bile ducts in spayed bitches)**

**Increases risk of patellar luxation in small+medium sized dogs**

**Increases risk of adverse vaccine reactions**

**Increases risk of myasthenia gravis in spayed bitches**

**Increases risk of aggression, fearfulness**

**Increases cognitive impairment in aged dogs already showing signs of disease**

**Increases risk of peri-vulvar dermatitis, vaginitis, cystitis, and recurrent urinary tract infections in early age spayed bitches.**

**Increases risk of benign perianal tumors in spayed bitches**

**Increases risk of cranial cruciate ligament injury**

**Example: <http://users.lavalink.com.au/theos/Spay-neuter.htm>**

**Longevity, cancer and obesity: Healthwise, Canine Companions for Independence (provides trained assistance dogs) found that early age neutered dogs had increased incidence of osteosarcoma, haemangiosarcoma, and obesity [8].**

**Not early age neutering specifically, but related to neutering at a young age and resultant increased height and/or weight; in Golden retrievers, “Both bitches and dogs neutered at < 1 year of age were significantly taller as adults than those neutered at > or = 1 year of age or intact animals.” Further, “Among bitches and dogs, the taller the animal as an adult, the shorter the lifespan.” [65].**

Now when the extremists keep telling us that ALL dogs need to be altered (whether by MSN, to allegedly “save” the shelter dogs, to save the “feral cats” or just to do whatever the radicals TELL US they are doing—WHY should any of us believe anything they say?

As I have outlined for years, the extremists among us have no real desire to actually save or keep animals as pets. They don’t even believe in pet ownership (ONLY guardianship) Just look at the following quoted verbiage from an AR, below .....

“It doesn’t take any kind of grey matter to let two animals mate and result in more unwanted babies to make \$\$\$ off of...” that was a response received, when it was pointed out that the majority of dogs in shelters are NOT from breeders of dogs, but rather from owners of dogs of medium-large breeds which engaged in unplanned ties, not breeding purposely done as a livelihood or hobby.

”We just won a MSN here (mandatory spay/neuter) - we’ll continue EVERYWHERE until the “male, juvenile mixed breed dogs, or old dogs, handicapped dogs, scared dogs, skittish dogs, unsocial dogs, and maligned breeds etc.” as you so lovingly call them find loving homes from people with a soul and a conscience and have LOVE to give them”

That was the response received when it was pointed out that dogs not readily adoptable (dogs with issues, behavior problems, biters, severe separation anxiety, overly skittish, etc) are pushed onto people, or such dogs are made readily available on forums like Craigslist pets, while they flag off normal dogs that need homes. It was also pointed out that rescued, re-homed/shelter dogs only make up 15-18% of all dogs but are involved in 50%+ of the fatal attacks against people.

“Breeders are greedy snobs and most “bought” dogs I have seen have WAYYYYY more problems than any grateful dog at a shelter. THEY are the sick ones. THEY are the ones with the schitzoid personalities.”

This was the answer received in regard to the mixed male juvenile medium -large breed dogs that often cannot find homes, where such dogs were acquired at little to no cost and then abandoned at ages 1-2.5yr. I never mentioned anything re a schizophrenic personality.

“You are killers. No, we don’t want to see the end of being GUARDIANS (not owners) of pets, just more loving and less focused on the pedigree and conformation... A perfect body doesn’t make a better pet, and you breeders are just money grubbing idiots at the expense of your products.”

I am not a dog breeder but I believe that those who want to sell the public a dog that the public wants should be able to do so in a free enterprise system. Apparently extremists disagree and believe the free enterprise system does not include dog breeders.

“ We will NEVER back down, rest assured. We are growing in numbers while you lose more and more of your rights to kill. You kill dogs, that is what you do.”

And there you have it. Animal extremists with the brains. NOT.

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Accessed March 13, 2009:

1. Slauterbeck JR, Pankratz K, Xu KT, et al. Canine ovariohysterectomy and orchiectomy increases the prevalence of ACL injury. *Clin Orthop* 2004;429:301-305. The prevalence of anterior cruciate ligament rupture in all dogs was 3.48%. Females that had ovariohysterectomy and males that had orchiectomy had a significantly higher prevalence of anterior cruciate ligament rupture than the sexually intact dogs. Larger dogs had an increased prevalence of anterior cruciate ligament injury compared with smaller or medium-sized dogs, with the increased rupture rates for sterilized animals holding across breeds and sizes. Sterilization of either gender increased the prevalence of anterior cruciate ligament injury, suggesting a potential effect of gonadal gender on prevalence of injury of this ligament.

2. Smith AN. Hemangiosarcoma in dogs and cats. *Vet Clin North Am Small Anim Pract* 2003;33:533-552. Prymak C, McKee LJ, Goldschmidt MH, et al.

Epidemiologic, clinical, pathologic, and prognostic characteristics of splenic hemangiosarcoma and splenic hematoma in dogs: 217 case

Compared with sexually intact females, spayed females were at significantly increased risk for developing splenic hemangiosarcoma.

3. Ware WA, Hopper DL. Cardiac tumors in dogs: 1982-1995. *J Vet Intern Med* 1999;13:95-103. Tumors occurred with similar frequency in males and females, but the relative risk for spayed females was >4 times that for intact females. For HSA, spayed females had >5 times greater relative risk than did intact females. The risk for castrated males was slightly greater than that for intact males, which had 2.4 times the relative risk of intact females. Thus, neutering appeared to increase the risk of cardiac tumor in both sexes.

4. Prostate. 2007 Aug 1;67(11):1174-81. A population study of neutering status as a risk factor for canine prostate cancer. Bryan JN, Keeler MR, Henry CJ, Bryan ME, Hahn AW, Caldwell CW. Neutered males had a significantly increased risk for each form of cancer. Neutered males had an odds ratio of 3.56 (3.02-4.21) for urinary bladder TCC, 8.00 (5.60-11.42) for prostate TCC, 2.12 (1.80-2.49) for prostate adenocarcinoma, 3.86 (3.13-4.16) for prostate carcinoma, and 2.84 (2.57-3.14) for all prostate cancers

5. Long-term risks and benefits of early-age gonadectomy in dogs. Spain CV, Scarlett JM, Houpt KA.

Department of Population Medicine and Diagnostic Science, College of Veterinary Medicine, Cornell University, Ithaca, NY 14853, USA.

Among male and female dogs with early-age gonadectomy, hip dysplasia, noise phobias, and sexual behaviors were increased. For female dogs, however, increased urinary incontinence (The incidence of urinary incontinence in spayed large breed female dogs is up to 9%.) suggests that delaying gonadectomy until at least 3 months of age may be beneficial. This article does suggest early spay-neuter for SHELTER dogs.

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Accessed December 30, 2008:

## Veterinary Practice News

### Complications? What Complications?

By Phil Zeltzman, DVM, Dipl. ACVS

Complications after a spay are more common than one might think. Slatter's Textbook of Small Animal Surgery reports the following complication rates in the Ovary and Uterus chapter:

- \* 18 percent overall complications in one study.
- \* 33 percent suture reactions in another one.

Some complications include:

- \* Hemorrhage (the most common cause of death).
- \* Ovarian remnant syndrome.
- \* Uterine stump pyometra, inflammation and granuloma.
- \* Fistulous tracts, typically due to braided, non-absorbable suture material used as ligatures.
- \* Ligation of a ureter.
- \* Urinary incontinence in 11 percent to 20 percent of cases.
- \* Weight gain of 26 percent to 38 percent.

Additionally, problems related to any abdominal surgery include anesthesia complications, delayed wound healing or dehiscence, incisional infection, self-trauma to the incision and retained gauze square.

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Accessed December 30, 2008:

<http://www.veterinarypracticenews.com/web-exclusives/complications-what-complications.aspx>

from the (short) article:

Slatter's Textbook of Small Animal Surgery reports the following complication rates in the Ovary and Uterus chapter:

- \* 18 percent overall complications in one study.
- \* 33 percent suture reactions in another one.

<http://www.veterinarypracticenews.com/vet-practice-news-columns/surgical-insights/should-you-oe-or-should-you-ohe.aspx>

ovariectomy vs. ovariohysterectomy

also of interest

<http://www.veterinarypracticenews.com/vet-cover-stories/pet-insurance-rising-in-down-economy.aspx>

confirms that only about 1% of pets are insured (to which I would add - nonetheless, insurance is driving vet pricing, by the "insist on itemizing everything" demon.)

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Accessed December 10, 2006 (complete):

### **SPAY/NEUTER RISKS FOR DOGS**

Compiled by Margo Milde – mrm1206@yahoo.com

(Updated 12/06)

### **JOURNAL ARTICLES, AKC REPORTS, BREED CLUB STATS**

[http://www.akcchf.org/pdfs/whitepapers/Biennial\\_National\\_Parent\\_Club\\_Canine\\_Health\\_Conference.pdf](http://www.akcchf.org/pdfs/whitepapers/Biennial_National_Parent_Club_Canine_Health_Conference.pdf)

**AKC National Parent Club 2005 Canine Health Conference Notes**

**“Measuring Behavior and Temperament in Dogs” James Serpell, PhD, University of Pennsylvania**

**“The C-BARQ (Canine Behavioral Assessment and Research Questionnaire Dr. Serpell developed to assess temperament and behavior) also found 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. Dr. Serpell considers these differences disturbing and said additional study was needed.”**

<http://cebp.aacrjournals.org/cgi/content/full/11/11/1434>

(full text article available for free)

**Article: “Endogenous Gonadal Hormone Exposure and Bone Sarcoma Risk”**

**Dawn M. Cooley, Benjamin C. Beranek, Deborah L. Schlittler, Nita W. Glickman, Lawrence T. Glickman and David J. Waters**

**(Cancer Epidemiology Biomarkers & Prevention Vol. 11, 1434-1440, November 2002)**

**Proven link between early neutering in Rotties and risk of osteosarcoma in both bitches and dogs – note that the result was independent of body size (a previously recognized risk factor for osteosarcoma in dogs)**

**“DISCUSSION:... In this study, we found a strong inverse association between lifetime exposure to gonadal hormones and risk of spontaneous bone sarcoma. Gonadal hormone exposure was a significant risk factor of bone sarcoma independent of adult body size, a previously recognized risk factor for bone sarcoma.”**

[http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list\\_uids=11439769](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11439769)

**Abstract: “Effect of gonadectomy on subsequent development of age-related cognitive impairment in dogs” Hart BL. (J Am Vet Med Assoc. 2001 Jul 1;219(1):51-6.)**

**“CONCLUSIONS AND CLINICAL RELEVANCE: Results suggest that the presence of circulating testosterone in aging sexually intact male dogs may slow the progression of cognitive impairment, at least among dogs that already have signs of mild impairment.”**

[http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list\\_uids=9227747](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9227747)

**Abstract: “Effects of castration on problem behaviors in male dogs with reference to age and**

duration of behavior” Neilson JC, Eckstein RA, Hart BL. (J Am Vet Med Assoc. 1997 Jul 15;211(2):180-2.)

**“CLINICAL IMPLICATIONS: Castration was most effective in altering objectionable urine making, mounting, and roaming. With various types of aggressive behavior, including aggression toward human family members, castration may be effective in decreasing aggression in some dogs, but fewer than a third can be expected to have marked improvement.”**

(My comment for above: in abstract, also said castration made little or no different in aggression toward unfamiliar humans, and less than 35% showed significant improvement in aggression toward human family members! yet castration is still advocated by vet orgs/humane groups as a way to control human-directed aggression! what ever happened to effective training methods???)

<http://epirev.oxfordjournals.org/cgi/reprint/20/2/204>

**“Epidemiologic Studies of Risk Factors for Cancer in Pet Dogs”**

Jennifer L. Kelsey, Antony S. Moore, and Lawrence T. Glickman

(Epidemiologic Reviews, Vol. 20, No. 2, 1998, The Johns Hopkins University School of Hygiene and Public Health)

See sections “Osteosarcoma” (p. 209) and “Bladder and urethral cancer” (p. 210.)

[http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list\\_uids=8175472&opt=Citation](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=8175472&opt=Citation)

**“Hypothyroidism in dogs: 66 cases (1987-1992)” (Abstract) Panciera DL.**

(J Am Vet Med Assoc. 1994 Mar 1;204(5):761-7.)

Quote: “Neutering was determined to be the most significant gender-associated risk factor for development of hypothyroidism. Neutered male and spayed female dogs had a higher relative risk of developing hypothyroidism than did sexually intact females. Sexually intact females had a lower relative risk.”

Golden Retriever Health Survey (see p. 162 and page on association between early neutering and hypothyroidism in Goldens): <http://www.grca.org/healthsurvey.pdf>

See study comments on p. 162 linking hypothyroidism in Goldens and early neutering, and comments on p. 166 regarding "selection bias" as the possible reason why neutered Goldens only appear to live longer than intact Goldens! To quote:

**"The difference in age at death between intact and neutered dogs probably resulted from selection bias rather than from any biological advantage to neutering. For example, for a dog to be neutered at 8+ years of age, it must first live at least 8 years. Thus, only older dogs fall in this age category and this artificially results in an older age at death. Also, Goldens in this population were probably neutered earlier in life if they had physical or medical problems that made them unsuitable for breeding. Such Goldens would be less likely to live as long as others, which were neutered later in life when their breeding was completed."**

[http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list\\_uids=12431819&itool=iconabstr&query\\_hl=3&itool=pubmed\\_DocSum](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12431819&itool=iconabstr&query_hl=3&itool=pubmed_DocSum)

**“Canine prostate carcinoma: epidemiological evidence of an increased risk in castrated dogs” (Abstract)**

Teske E, Naan EC, van Dijk EM, Van Garderen E, Schalken JA. (Mol Cell Endocrinol. 2002 Nov 29;197(1-2):251-5.)

**Quote:**

**“The interval between castration and onset of prostatic problems was highly variable, suggesting that castration does not initiate the development of PCA in the dog, but it does favour tumor progression.”**

**(NOTE: this study had opposite conclusion re: risk of development of PCA in the neutered male than the following article, which I cited below:**

**“Prostatic disorders in the dog” (Abstract) Johnston, SD; Kamolpatana, K; Root-Kustritz, MV; Johnston, GR; (ANIMAL REPRODUCTION SCIENCE, volume: 60, year: 2000, pages: 405 – 415)**

**[http://serials.cib.unibo.it/cgi-ser/start/it/spogli/dfs.tcl?prog\\_art=2893911&language=ITALIANO&view=articoli](http://serials.cib.unibo.it/cgi-ser/start/it/spogli/dfs.tcl?prog_art=2893911&language=ITALIANO&view=articoli)**

**“Prostatic disorders in the dog” (Abstract) Johnston, SD; Kamolpatana, K; Root-Kustritz, MV; Johnston, GR; (ANIMAL REPRODUCTION SCIENCE, volume: 60, year: 2000, pages: 405 – 415)**

**Quote: “Two studies suggest that risk of prostatic adenocarcinoma is increased in neutered, compared to intact male dogs.”**

**[http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list\\_uids=10225598&itool=iconabstr&query\\_hl=3&itool=pubmed\\_DocSum](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10225598&itool=iconabstr&query_hl=3&itool=pubmed_DocSum) “Cardiac tumors in dogs: 1982-1995.” (Abstract) Ware WA, Hopper DL. (J Vet Intern Med. 1999 Mar-Apr;13(2):95-103.)**

**Quote:**

**“For HSA (hemangiosarcoma), spayed females had >5 times greater relative risk than did intact females. The risk for castrated males was slightly greater than that for intact males, which had 2.4 times the relative risk of intact females. Thus, neutering appeared to increase the risk of cardiac tumor in both sexes. Intact females were least likely to develop a cardiac tumor, whereas spayed females were most likely to develop a tumor.”**

**[http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list\\_uids=9411733&dopt=Citation](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=9411733&dopt=Citation)**

**“Urinary incontinence in castrated bitches. Part 1: Significance, clinical aspects and etiopathogenesis (Abstract)” Arnold S. (Schweiz Arch Tierheilkd. 1997;139(6):271-6)**

**Quote: “Acquired urinary incontinence occurs in 20% of spayed dogs and there exists a strong correlation between body weight and the risk of urinary incontinence...Urinary incontinence due to spaying manifests itself mainly while the dogs are sleeping. The cause is a urethral sphincter incompetence which can be verified by a urethral pressure profile (UPP). The microtransducer method proved to be a suitable method for urodynamic studies. It could be demonstrated that the urethral closure pressure is significantly lower in incontinent bitches (4.6 +/- 2.3 cm H2O) than in continent bitches (18.6 +/- 10.5 cm H2O). In addition, the urethral closure pressure for continent bitches dropped significantly within 12 months after surgery.”**

A Aaron, K Eggleton, C Power, and PE Holt

<http://veterinaryrecord.bvapublications.com/cgi/content/abstract/139/22/542>

“Urethral sphincter mechanism incompetence in male dogs: a retrospective analysis of 54 cases” (Abstract) (The Veterinary Record, Vol. 139, Issue 22, 542-546)

Quote: “Incompetence of the urethral sphincter mechanism is uncommon in male dogs... As in the bitch, the condition can occur either as a congenital or as an acquired condition, in which neutering may play a part; larger breeds appear to be at greater risk.”

Howe, L.M., Slater, M.R., Boothe, H.W., Hobson, H.P., Holcom, J.L., Spann, A.C. (2001). “Long-term outcome of gonadectomy performed at an early age or traditional age in dogs.” Journal of the American Veterinary Association, Jan 15; 218(2):217-21. Retrieved from PubMed November 2, 2006.

<http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&listuids=11195826>

(Note that this study used shelter dogs, which are mostly mixed breeds; therefore they probably weren’t able to observe breed-specific problems – however, their conclusion on increased infection is interesting.)

“RESULTS: Prepubertal gonadectomy did not result in an increased incidence of behavioral problems or problems associated with any body system, compared with traditional-age gonadectomy, during a median follow-up period of 48 months after gonadectomy. Rate of retention in the original adoptive household was the same for dogs that underwent prepubertal gonadectomy as those that underwent traditional-age gonadectomy. Infectious diseases, however, were more common in dogs that underwent prepubertal gonadectomy.”

Stocklin-Gautschi, N.M., Hassig, M., Reichler, I.M., Hubler, M., Arnold, S. (2001). “The relationship of urinary incontinence to early spaying in bitches”. Journal of Reproductive Fertility Supplement 2001, Volume 57, pages 233-6. Retrieved from PubMed November 2, 2006.

<http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&listuids=11787155>

Conclusions: “Urinary incontinence after spaying (before their first oestrus) occurred in 9.7% of bitches. This incidence is approximately half that of spaying after the first oestrus. Urinary incontinence affected 12.5% of bitches that were of a large body weight (> 20 kg body weight) and 5.1% of bitches that were of a small body weight (< 20 kg body weight). The surgical procedure (ovariectomy versus ovariohysterectomy) had no influence on the incidence, or on the period between spaying and the occurrence of urinary incontinence. Urinary incontinence occurred on average at 2 years and 10 months after surgery and occurred each day, while the animals were awake or during sleep. However, compared with late spaying the clinical signs of urinary incontinence were more distinct after early spaying.”

## COMPILATIONS: BREEDER and VET OPINIONS

<http://www.showdogsupersite.com/kenclub/breedvet/castrationindogs.html>  
Breeder Vet – Show Dog Super Site Mary Wakeman DVM

Dr. Wakeman is the owner of Ashford Animal Clinic - Canine Fertility Center (Ashford CT) and a long time Puli breeder, and states that (in males) increased risk of prostate cancer and increased orthopedic problems (including cruciate ruptures) are strong reasons against neutering.

<http://www.caninesports.com/SpayNeuter.html>  
Zink, Chris DVM, PhD, DACVP. (2005). "Early Spay-Neuter Considerations for the Canine Athlete: One Veterinarian's Opinion." Canine Sports Productions. Retrieved November 2, 2006.

Quote "For canine athletes, I currently recommend that dogs and bitches be spayed or neutered after 14 months of age."

Blue Knight Labradors, AKC Labrador breeder in southern California, speaks out against the mandatory Los Angeles spay/neuter ordinance, citing a number of adverse health effects of early spay/neuter (2006):

<http://www.blueknightlabs.com/> click on Los Angeles ordinance info on their home page, they cite additional studies at the very end of the piece.

<http://www.littleriverlabs.com/neuter.htm>  
Article: "The Question of Neutering and at what age"  
Author is Pam Davol, long time breeder of Labrador Retrievers

My note: Author Pam Davol (who has a pharmacology background) wrote this article on risks of early neutering, she cites several interesting articles. Pam's article has been linked to extensively on a number of dog websites.

Milani, Myrna, DVA. "Spay, Neuter, and Cancer: Revisiting and Old Trinity". Mmilani.com. Retrieved November 2, 2006. < <http://www.mmilani.com/commentary-200509.html> >

First paragraph: "Perhaps no aspect of pet ownership in the U.S. elicits as passionately supportive emotions as the subject of spay and neuter. In fact, this orientation is so well established that saying anything that questions the procedure is akin to blasphemy. However, just as women were routinely relieved of their reproductive organs with a "La de da, you'll never miss 'em" attitude until studies exploring the nonreproductive effects of reproductive hormones made human physicians rethink this position, so veterinarians and other animal-care professionals are making tentative moves to rethink wholesale sterilization of companion animals, too."

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Accessed May 3, 2008:

<http://www.naiaonline.org/pdfs/LongTermHealthEffectsOfSpayNeuterInDogs.pdf>

**Long-Term Health Risks and Benefits Associated with Spay / Neuter in Dogs**  
Laura J. Sanborn, M.S.

May 14, 2007

**Precis**

At some point, most of us with an interest in dogs will have to consider whether or not to spay / neuter our pet. Tradition holds that the benefits of doing so at an early age outweigh the risks. Often, tradition holds sway in the decision-making process even after countervailing evidence has accumulated.

Ms Sanborn has reviewed the veterinary medical literature in an exhaustive and scholarly treatise, attempting to unravel the complexities of the subject. More than 50 peer-reviewed papers were examined to assess the health impacts of spay / neuter in female and male dogs, respectively. One cannot ignore the findings of increased risk from osteosarcoma, hemangiosarcoma, hypothyroidism, and other less frequently occurring diseases associated with neutering male dogs. It would be irresponsible of the veterinary profession and the pet owning community to fail to weigh the relative costs and benefits of neutering on the animal's health and well-being. The decision for females may be more complex, further emphasizing the need for individualized veterinary medical decisions, not standard operating procedures for all patients.

No sweeping generalizations are implied in this review. Rather, the author asks us to consider all the health and disease information available as individual animals are evaluated. Then, the best decisions should be made accounting for gender, age, breed, and even the specific conditions under which the long-term care, housing and training of the animal will occur.

This important review will help veterinary medical care providers as well as pet owners make informed decisions. Who could ask for more?

Larry S. Katz, PhD  
Associate Professor and Chair  
Animal Sciences  
Rutgers University  
New Brunswick, NJ 08901

## **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 longterm 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 (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 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.

(continued at the link given above)

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## Determining the optimal age for gonadectomy of dogs and cats

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Elective gonadectomy of dogs and cats, most commonly performed as an OHE of females and castration of males, is one of the most common veterinary procedures performed in the United States.<sup>1</sup> Increasingly, dog owners and members of the veterinary profession throughout the world have questioned the optimal age for performance of these surgeries or whether they should even be performed as elective surgeries. The objective for the information reported here was to provide a review of the scientific evidence, which could be used by veterinarians to counsel clients appropriately on this issue.

### Abbreviations

OHE Ovariohysterectomy

TCC Transitional cell carcinoma

CCL Cranial cruciate ligament

FLUTD Feline lower urinary tract disease

BPH Benign prostatic hypertrophy-hyperplasia

### Traditional Age at Gonadectomy

Currently, most veterinarians in the United States recommend that elective gonadectomy be performed in dogs and cats at 6 to 9 months of age. However, there does not appear to be any scientific evidence to document that this is the optimal age. In fact, the age at which pets have traditionally been spayed and neutered has varied through the years and with geographic location.

In the early 1900s, OHE was performed at 3 to 6 months of age and castration as early as 4 weeks of age.<sup>2</sup> Over time, the recommended age for elective gonadectomy of small animals increased to 6 to 9 months of age. It has been hypothesized that this was the result of an increasing popularity of dogs and cats as pets as American citizens found themselves with more disposable income, a subsequent desire by those pet owners for reproduction control in their animals, and the intent of veterinarians to provide the safest possible anesthesia and surgery for these new “family members.”

Despite great advances in anesthetic and surgical techniques and multiple studies that provide evidence for the safety of anesthesia and surgery in dogs and cats of younger ages, veterinarians in the United States still cling to the recommendation to perform gonadectomy at 6 to 9 months of age, with the added stipulation that bitches and queens should be spayed before their first estrus.

In some parts of the world, elective gonadectomy is considered unethical and is strongly discouraged or disallowed by professional veterinary associations.<sup>2</sup> Elective gonadectomy is illegal in at least 1 country.<sup>3</sup> In 1 article<sup>4</sup> published in Europe, elective gonadectomy is decried as “the tool of despots and tyrants throughout history,” and the author of that article claims that gonadectomized dogs are “canine eunuchs, condemned to live their lives in a physical and mental twilight.” That author also questions how a profession that publicly declares itself the guardian of animal welfare can, with impunity, perform elective surgery on animals for human convenience.<sup>4</sup>

Cultural and personal factors, including religious affiliation, ethnic background, intended working life of the animal, urban or rural location of the household, and literacy status, also may

be associated with the likelihood that an owner will request gonadectomy for a pet.<sup>5-7</sup> Species and sex also play a role; in retrospective surveys, cats are more likely to be spayed or castrated than dogs, and bitches and queens are more likely to have undergone elective gonadectomy than stud dogs or tomcats.<sup>6-9</sup>

Surgical and anesthetic techniques for elective gonadectomy in dogs and cats of various ages are provided in the veterinary literature.<sup>10-12</sup> The reported incidence of postoperative complications in 1,016 dogs and 1,459 cats after elective surgery was 6.1% and 2.6%, respectively, with most of these considered minor problems, including inflammation at the incision site and gastrointestinal tract upset.<sup>13</sup>

Complications were more common in dogs that underwent surgery when they were > 2 years of age.<sup>13</sup> In a study<sup>14</sup> in which investigators evaluated complications in 142 dogs undergoing OHE performed by fourth-year veterinary students, incidence of intraoperative complications was 6.3% and incidence of postoperative complications was 14.2%. Again, most of these were minor, including self-resolving hemorrhage and inflammation at the incision site and gastrointestinal tract upset. In that study,<sup>14</sup> the high incidence of postoperative complications was associated with an increase in surgery time, which was in turn positively correlated with increasing body weight of the animal. In studies<sup>15-17</sup> in which incidence of intraoperative and postoperative complications for elective gonadectomies performed at various ages was compared, the only com-

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Accessed November 4, 2009:

<http://www.gpmcf.org/respectovaries.html>

<http://tinyurl.com/y86mv4s>

#### A Healthier Respect for Ovaries

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A recent study by my research group appearing next month in *Aging Cell* reveals shortened longevity as a possible complication associated with ovary removal in dogs (1). This work represents the first investigation testing the strength of association between lifetime duration of ovary exposure and exceptional longevity in mammals. To accomplish this, we constructed lifetime medical histories for two cohorts of Rottweiler dogs living in 29 states and Canada: Exceptional Longevity Cohort = a group of exceptionally long-lived dogs that lived at least 13 years; and Usual Longevity Cohort = a comparison group of dogs that lived 8.0 to 10.8 years (average age at death for Rottweilers is 9.4 years). A female survival advantage in humans is well-documented; women are 4 times more likely than men to live to 100. We found that, like women, female Rottweilers were more likely than males to achieve exceptional longevity (Odds Ratio, 95% confidence interval = 2.0, 1.2 - 3.3;  $p = .006$ ). However, removal of ovaries during the first 4 years of life erased the female survival advantage. In females, this strong positive association between ovaries and longevity persisted in multivariate analysis that considered other factors, such as height, adult body weight, and mother with exceptional longevity.

In summary, we found female Rottweilers who kept their ovaries for at least 6 years were 4.6 times more likely to reach exceptional longevity (i.e. live >30 % longer than average) than females with the shortest ovary exposure. Our results support the notion that how long females keep their ovaries determines how long they live.

In the pages that follow, I have attempted to frame these new findings in a way that will encourage veterinarians to venture beyond the peer-reviewed scientific text and data-filled tables of Aging Cell to consider the pragmatic, yet sometimes emotionally charged implications of this work. Call it a primer for the dynamic discussions that will undoubtedly take place, not only between practitioners and pet owners, but also within the veterinary profession. Call it a wake-up call for how little veterinarians have been schooled in the mechanistic nuts and bolts underlying the aging process. Call it an ovary story.

Do ovaries really promote longevity? Observed associations between exposures and outcomes may not necessarily be causal, so we explored alternative, non-causal explanations for the association between ovaries and exceptional longevity in our study. But we found no evidence that factors which may influence a pet owner's decision on age at ovary removal — for example, earlier ovariectomy in dogs with substandard conformation or delayed ovariectomy to obtain more offspring in daughters of long-lived mothers — could adequately account for the strong association.

There is another aspect of our data pattern that gives us further confidence that ovaries really do matter when it comes to successful aging. A simple explanation for the observation that ovaries promote longevity would be that taking away ovaries increases the risk for a major lethal disease. In Rottweilers, cancer is the major killer. We found, however, that by conducting a subgroup analysis that excluded all dogs that died of cancer, the strong association between intact ovaries and exceptional longevity persisted. After excluding all cancer deaths, females that kept their ovaries the longest were 9 times more likely to reach exceptional longevity than females with shortest ovary exposure. Thus, we observed a robust ovarian association with longevity that was independent of cause of death, suggesting that a network of processes regulating the intrinsic rate of aging is under ovarian control. This work positions pet dogs, with their broad range of lifetime ovary exposure, to become biogerontology's new workhorse for identifying ovary-sensitive physiological processes that promote healthy longevity.

Interestingly, our findings in dogs surface just as data from women are calling into question whether those who undergo hysterectomy should have ovary removal or ovary sparing. In fact, our results mirror the findings from more than 29,000 women in the Nurses' Health Study who underwent hysterectomy for benign uterine disease (2). In that study, the upside of ovariectomy — protection against ovarian, uterine, and breast cancer — was outweighed by increased mortality from other causes. As a result, longevity was cut short in women who lost their ovaries before the age of 50 compared with those who kept their ovaries for at least 50 years.

Taken together, the emerging message for dogs and women seems to be that when it comes to longevity, it pays to keep your ovaries.

But before we all go out and buy T-shirts with some romantic imperative like "Save the Ovaries", perhaps we should step back and consider the following question: Why haven't previous dog studies called our attention to this potential downside of ovariectomy? Reviewing the literature, an answer quickly bubbles up. No previous studies in pet dogs have rigorously evaluated the association between ovaries and longevity. Two frequently cited reports (3,4) provide limited guidance because: (1) longevity data are presented as combined mean age at

death for a relatively small number of individuals of more than 50 breeds of different body size and life expectancy; and (2) ovarian status is reported as “intact” or “spayed”, rather than as number of years of lifetime ovary exposure.

Comparing female dogs binned into the categories of “intact” versus “spayed” introduces a methodological bias that might lead one to conclude that ovaries adversely influence longevity, i.e. ovary removal promotes longevity. Because the reasons for ovariectomy (e.g., uterine infection, mammary cancer) increase with increasing age, it is expected that a large percentage of the oldest-dogs are binned as “spayed” despite having many years of ovary exposure. For example, a dog who at age 12 undergoes ovariohysterectomy for pyometra would be binned as “spayed”, despite 12 years of ovary exposure.

In our study, we employed a more stringent study design — restricting the study population to AKC registered, pure-bred dogs of one breed, carefully quantitating the lifetime duration of ovarian exposure — in order to lessen the likelihood of such bias. And we reasoned that studying veterinary teaching hospital-based populations of dogs with artifactually low life expectancies (for example, 3.5 years is median age at death for Rottweilers in the Veterinary Medical Data Base)(5) was an inappropriate vehicle to describe the influence that ovaries have on aging. So we cast a wider net and collected data from Rottweiler owners nationwide, focusing our attention on exceptional longevity, not average age at death, as our study endpoint.

Why study exceptional longevity? Why not average longevity? We thought studying the most exceptionally long-lived individuals would tell us something about what it takes to age successfully. It’s the same rationale used by Thomas Perls and investigators of the New England Centenarian Study (6) and by other scientists who study long-lived humans in other parts of the world (7). The approach even garners support from the mathematical field. In a seminal book on the origins of creative genius, the mathematician Jacques Hadamard wrote: “In conformity with a rule which seems applicable to every science of observation, it is the exceptional phenomenon which is likely to explain the usual one.” (8) Hadamard was trying to understand how the brain gets creative so he studied people with extreme creativity. When it comes to studying aging, we’re solidly in the Hadamard camp. That is why in 2005 we established the Exceptional Longevity Data Base, launching the first systematic study of the oldest-old pet dogs (9). But folks in the opposing camp might justifiably fire back: “Don’t study extreme longevity. Extreme longevity is much more about luck than it is about genes, or environment, or ovaries.”

So to address the possibility that the “strangeness” or outlier nature of dogs with exceptional longevity could be forging a misleading link between ovaries and longevity, we studied a separate cohort of Rottweiler dogs. This data set was comprised of 237 female Rottweilers living in North America that died at ages 1.2 to 12.9 years — none were exceptionally long-lived. Information on medical history, age at death, and cause of death was collected by questionnaire and telephone interviews with pet owners and local veterinary practitioners. In this population, we found females that kept their ovaries for at least 4.5 years had a statistically significant 37% reduction in mortality rate (1). This translated into a median survival of 10.4 years for females with more than 4.5 years of ovary exposure — 1.4 years longer than the median survival of only 9.0 years in females with shorter ovary exposure ( $p < 0.0001$ ). Taken together, if you take out ovaries before 4 years of age you cut longevity short an average of 1.4 years and decrease the likelihood of reaching exceptional longevity by 3-fold.

Up to this point, my ovary story has centered around a summarizing of methodologies and results. The reader has been given opportunity to see the gist of our findings within the context of previous dog studies and late-breaking studies in women. Now, let us pivot our attention a bit away from the results to focus on the recipients of these results — DVMs and pet owners.

We can start by tackling the question: Just how receptive will DVMs be to these new research findings? It's hard for old dogs to learn new tricks. But one thing is sure — blossoming change is rooted in real communication. The anthropologist Gregory Bateson wrote: “The pre-instructed state of the recipient of every message is a necessary condition for all communication. A book can tell you nothing unless you know 9/10ths of it already.” (10). I call this “Bateson’s Rule of the 9/10ths”. If Bateson is right, then we will want to do something about the pre-instructed state of veterinarians. Because when it comes to the biology of aging, the state is virtually a blank slate. None of us received training in the biology of aging as part of our DVM curriculum — whether we graduated 30 years ago or last summer. Therefore, most DVMs are ill-prepared to receive messages examining the mechanistic underpinnings of the aging process. A Batesonian prescription for positive change would be to ratchet up the biology of aging IQ of practicing veterinarians. We agree. That is why we established the first gerontology training program for veterinarians in 2007 (11). We believe that by helping veterinarians “know” more about aging, they will be more able and more receptive to communicating the things that promote healthy longevity in their patients — things like preserving ovaries.

For certain, DVMs will be asked by pet owners to help them make their decision about age at spay in light of this new information. The question will be asked: Just how generalizable are these findings in Rottweilers to other segments of the pet dog population? It is impossible to say at this time. It will demand further study. Alas, 10 years from now, we might just find out that a longevity-promoting effect of ovaries in dogs is limited — limited to large breeds, urban but not rural dogs, or only those individuals with particular polymorphisms in insulin-like growth factor-1. These restrictions should not only be expected, they should be celebrated. It will mean that we have looked more deeply into how ovaries might influence healthy longevity. It will mean that our initial findings have been contextualized. And it is this contextualization of information that marks scientific progress — the kind of progress that guides sound clinical decision making. For it is context that determines meaning (12).

Our provocative findings in Aging Cell mean that it's time to re-think the notion that taking away ovaries has no significant downside to a dog's healthy longevity. Perhaps it would help us if we thought of lifetime ovary exposure as information — information that instructs the organism. Just how long and how healthy a female lives reflects what her cells, tissues, and organs thought they heard from the message received. Of course in biology, there is no single message but a symphony of messages, enabling each individual to successfully respond to environmental challenges. Our findings suggest that ovaries orchestrate that symphony. Taking away ovaries in early or mid-life makes for muddled information, less than perfect music.

Information muddling can ensnarl decision-making. Our research takes an important first step toward disentangling the thinking about ovaries and longevity. We must never be paralyzed by the incompleteness of our knowledge. Our knowledge will always be incomplete — subject to revision, primed for further inquiry. This uncertainty, although invigorating for the investigator, is often painful for the practitioner who seeks simple, fact-driven algorithms to guide his action. Just as scientists will be called upon to forge ahead with their scientific inquiries, so too will practitioners be counted on to master the uncertainty. Together, we must navigate what the Danish philosopher-theologian Soren Kierkegaard called the gap “between the understanding and the willing.” That is, we must ask the right questions and make smart choices so that our

action (the willing) is in synch with our knowledge (the understanding). Under just what circumstances will a particular individual benefit from specific lifestyle decisions? This is perhaps the most prescient, overarching question in the wellness and preventive medicine fields facing both human and veterinary health professionals today. How can we promote healthy longevity? Antioxidant supplementation or calorie restriction? Ovary removal or ovary sparing?

Undoubtedly, there will be protagonists and antagonists in this ovary story. The protagonists will be open-minded to following a new script. They will embrace the idea of ovary sparing for critical periods of time to maximize longevity. They might even recognize the need for some sort of "ovarian mimetic" in spayed dogs to optimize healthy aging. The antagonists in this story — the defenders of the old script — will dismiss as trivial the notion that ovaries regulate the rate of aging and influence healthy longevity. Lines will be drawn and opinions will fly. But that's what healthy debate is — antagonists and protagonists keeping a high priority issue front and center, not allowing it to fade into the woodwork. It would seem that, in light of the new scientific findings, a contemporary dialogue should balance the potential benefits of elective ovary removal (13) with its possible detrimental effects on longevity.

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