Recent Research Raises Concerns Regarding Early Spaying/Neutering

Research · November 2015

DOI: 10.13140/RG.2.1.4791.9449

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The History of Spay/Neuter:

Whereas in the early part of the 20th century pet ownership was common only to rural American households, after World War 2 the country experienced the baby boom, an increased urbanization and suburbanization of society, and an expansion of pet ownership within non-rural households. Subsequently, with the advent of a significant increase in pet ownership in high-density population areas, concomitant problems developed. The number of stray and unwanted pets increased in regions where the issue received more political attention and posed greater public health and safety concerns than when stray pets remained principally a rural issue. Moreover, without strategic fertility control measures, given the frequency of stray dog and cat copulations and the size of resultant litters, the pet population grew prolifically.

County and city animal shelters became increasing burdens to the public coffers. Furthermore, the escalating frequency of canine and feline euthanasia at shelters was expensive, emotionally distasteful, and politically sensitive. Therefore, spaying and neutering were posed as logical and humane solutions to counter the pet overpopulation problem.[1]

Consequently, since the 1970's the veterinary industry and the public policy machine have strongly advocated the spaying/neutering of pet dogs.[2] Although population control was initially the primary rationale behind promoting the spay/neuter of pet dogs and cats, soon ancillary benefits were espoused as additional selling points.

The message spread quickly to pet owners. The first public spay/neuter clinic opened in Los Angeles in 1969.[3] Municipal and county governments began using fiscal inducement to encourage spaying and neutering, whereby they often doubled or tripled the registration cost for those owning fertile animals. Shelters and humane organizations commenced formal strategies that used word of mouth and marketing literature to actively promote spaying and neutering. The veterinary community likewise used its respected position to influence pet owners.

For the shelters, that did not have sufficient facilities or staff to handle the burgeoning pet population, marketing strategies and contracts requiring that the public spay and neuter adopted animals became a financial necessity to operate within allotted budgets. For the veterinary community, what started as a public policy initiative evolved into a major revenue producer at many small animal clinics.

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[1] Denise Flaim, "Risks and Benefits to Spaying and Neutering Your Dog," Whole Dog Journal, Feb 2013.
[2] Ibid.
[3] Cathy M. Rosenthal, "When Did U.S. Get First Spay/Neuter Clinic?", MySA, July 6, 2011.

Gradually, shelters and veterinarians encouraged pet owners to spay/neuter at progressively younger ages. By the 1990s, six months, the common age of first estrus for small-breed females, became the norm for both female and male dogs. As time marched on, the age became even younger. Nowadays, many shelters advocate pediatric spaying/neutering, whereby veterinary staff sterilize animals as young as 8 weeks of age.

The message became both logical and passionate. Prominent national humane and veterinary organizations communicated population, health, behavioral, and financial reasons for pet owners to sterilize their animals.[4][5][6][7][8] For those interested in greater detail about the pro-spay/neuter position, please read the links within footnotes 4 – 8.

The spay/neuter campaign strategy produced highly effective results. America's pet owners presently spay/neuter 83% of pet dogs and 91% of pet cats.[9] Furthermore, pet owners who do not spay or neuter their dogs or cats are often considered socially irresponsible and their pets are often ostracized from dog day care, dog parks, and some kennels, as advocates hope that peer pressure will continue to raise the percentage of sterilized animals.

Contrasting Viewpoints

However, there are prominent voices who question the benefit of spaying and neutering, especially early-age spaying and neutering. Ted Kerasote, the author of the best selling books *Merle's Door* and *Pukka's Promise*, wrote: "There is a growing body of scientific evidence that points to the harmful effects of spaying and neutering: shortened life span, increased risk of certain cancers, and increased incidence of ACL injuries. Depending on your situation, you may wish to delay the spaying or neutering of your dog until it is 14 months old or not sterilize it at all."[10] During his research for *Pukka's Promise*, Kerasote cited that dogs in Europe, where spaying/neutering is much less common, live significantly longer lives.

A Purdue University study published in 2009 showed that female dogs that keep their ovaries live longer lives. The study evaluated 305 Rottweilers. The conclusion by Dr. David Waters,

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[4] https://www.aspca.org/pet-care/top-10-reasons-spay-or-neuter-your-pet

[5] http://www.humanesociety.org/issues/pet_overpopulation/facts/why_spay_neuter.html

[6] http://pets.webmd.com/reasons-spay-neuter-pet

[7] http://www.pethealthnetwork.com/dog-health/dog-surgery-a-z/top-10-reasons-neuter-your-pet

[8] http://www.spayusa.org/benefits.php

[9] https://www.aspca.org/about-us/faq/pet-statistics

[10] http://www.kerasote.com/healthy-dogs.php

the lead author, was that female Rottweilers that remained intact till at least 6 years of age were 4.6 times more likely to reach "exceptional longevity," defined as 13 years of age.[111213]

Laura Sanborn, M.S., Tuft's University, published a thoroughly researched paper that cited 55 references. In her 2007 paper, advocated by Larry S. Katz, PhD, the Chair of Animal Sciences at Rutgers University, Sanborn objectively mentions both the positives and negatives of spaying/neutering. The positives for male dogs include elimination in risk of testicular cancer, a reduction of benign prostate disorders and perianal fistulas, and a possible reduction in risk of diabetes. The negatives for male dogs include an increase in the risk of osteosarcoma, hemangiosarcoma, hypothyroidism, geriatric cognitive impairment, obesity, prostate cancer, urinary tract cancer, orthopedic disorders, and adverse reaction to vaccines. According to Sanborn, the risk of urinary tract cancer is doubled, the risk of hypothyroidism and obesity is tripled, and the risk of prostate cancer is quadrupled.[14]

Sanborn writes, "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… 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 for the female dogs and the relative risk of various diseases in the different breeds."[15]

Her paper states that the positives of spaying include greatly reducing the risk of mammary tumors (if the spay is completed before 2.5 years of age), nearly eliminating the risk of pyometra (which would otherwise affect 23% of females and kill 1%), reducing the risk of perianal fistulas, and removing the small risk of uterine, cervical, and ovarian tumors. The negatives of spaying include significantly increasing the risk of osteosarcoma, doubling the risk of splenic hemangiosarcoma, quintupling the risk of cardiac hemangiosarcoma, tripling the risk of hypothyroidism, almost doubling the risk of obesity, causing urinary incontinence in 4 – 20% of dogs, more than tripling the risk of urinary tract infections, increasing the risk of vaginal infections, doubling the risk of urinary tract tumors, increasing the risk of orthopedic disorders, and increasing the risk of adverse reactions to vaccinations.[16]

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[11] http://www.gpmcf.org/EnclosurePRDec2009.pdf

[12] https://www.avma.org/News/JAVMANews/Pages/100301g.aspx

[13] Waters, David J, Kengeri, Seema S. Clever, Beth, et al., "Exploring Mechanisms of Sex Differences in Longevity: Lifetime Ovary Exposure and Exceptional Longevity in Dogs," Aging Cell (2009), 8, pp 752-755.

[14] Laura J. Sanborn, "Long-Term Health Risks and Benefits Associated with Spay/Neuter in Dogs," National Animal Interest Alliance, naiaonline.org, May 14, 2007.

[15] Ibid.

[16] Ibid.

Dr. Christine Zink, DVM, PhD, DACVP, DACVSMR, the Director of Molecular and Comparative Pathobiology at the Johns Hopkins School of Medicine, an expert in the field of canine athletic performance and canine stem cell therapies, and the American Veterinary Medical Association's 2009 Outstanding Woman Veterinarian of the Year,[17] also has doubts about the one-sided message delivered by universal spay/neuter supporters. In a paper first published in 2005 and revised in 2013 that footnotes 40 peer-reviewed studies, Zink notes:

a) the significantly delayed closure of growth plates in spayed females,
b) significantly elongated tibia, radius, and ulna bones in neutered male and spayed female dogs in comparison to intact adult animals,
c) a narrower cranial and orthopedic physique,
d) a significantly increased incidence of canine cruciate ligament (CCL) tears in spayed and neutered dogs,
e) a 50% increase in hip dysplasia in spayed and neutered dogs,
f) a 210% higher probability of patellar luxation in spayed and neutered dogs,
g) an increase in obesity in spayed and neutered dogs,
h) a 400% greater likelihood of spayed females developing cardiac hemangiosarcoma,
i) a 120% increased risk of spayed females developing splenic hemangiosarcoma,
j) a 2 – 3x greater chance of females and males developing bone cancer,
k) an approximately 3x increase in neutered male dogs developing benign prostate tumors and a 4x increase in prostate cancer,
l) a 3 – 4x greater probability of experiencing benign and cancerous tumors of the bladder in both male and female dogs,
m) significantly higher risks of mast cell cancer, lymphoma, and other cancers,
n) an increased risk of noise phobias in early-age spayed/neutered dogs,
o) an increased risk of undesirable mounting in early-age spayed/neutered dogs,
p) a significantly increased risk of reactivity in an experimental group of spayed German Shepherds,
q) a decrease in energy level for spayed and neutered dogs,
r) an increase in urinary incontinence in spayed females (and sometimes males) that increases the earlier the age of the spay,
s) an increased risk of hypothyroidism in both spayed and neutered dogs,
t) a 22x greater probability of fatal acute pancreatitis in spayed female dogs,
u) a 27 – 38% increase in vaccine reaction in spayed/neutered dogs,
v) and reduced lifespan in spayed Rottweilers.[18]

A 2013 study from the University of California, Davis, the top veterinary school in the United States according to US News & World Report,[19] examined 759 Golden Retrievers, a very large sample base for a veterinary study. The study found that:

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[17] https://en.wikipedia.org/wiki/M._Christine_Zink

[18] Christine Zink, "Early Spay-Neuter Considerations for the Canine Athlete: One Veterinarian's Opinion," Canine Sports Productions, 2005, revised 2013.

[19] http://grad-schools.usnews.rankingsandreviews.com/best-graduate-schools/top-health-schools/veterinarian-rankings

a) the incidence of hip dysplasia in neutered males was double the intact group,
b) whereas none of the intact dogs experienced CCL ruptures, 5% of the neutered male and 8% of the spayed females suffered CCL tears,
c) the lymphosarcoma rate in early-neutered males was 3x the rate in intact males,
d) the hemangiosarcoma rate in late-spayed females was 4x more than for early-spay or fertile females, and
e) the mast cell tumor rate was zero in intact females, but 6% in late spayed females.[20]

In a 2014 UC Davis study, noted canine researchers Benjamin and Lynette Hart compared the effects of neutering on 1,015 Golden Retrievers and 1,500 Labrador Retrievers. The purpose of the study was both to further the knowledge of the effects of spaying/neutering on canines and to determine the amount of breed relevance pertinent to the 2013 research. In the studied Labradors, early spaying/neutering doubled the incidence of joint disorders, whereas with Golden Retrievers early spaying/neutering increased the probability of joint issues by 4 – 5x. In female Labs, the rate of cancer only increased slightly in spayed animals, whereas with female Goldens spaying increased the rate of cancer by 3 – 4x. In both male Labs and Goldens neutering had little effect on cancer frequency in contrast to the intact group. The conclusion was that there was breed relevance to the effects of spaying/neutering on the probability of long-term health consequences.[21]

More research needs to be done on the influence of breed genetics in relation to the long-term health consequences of standard surgical sterilization. Raising further questions, there are veterinary studies that obtained conclusions disparate from those found in the papers cited previously.

For instance, an April 2013 paper authored by researchers from the University of Georgia Department of Genetics and College of Veterinary Medicine compared the age and cause of death of over 40,000 intact and sterilized domestic dogs. The conclusion was that "sterilization was strongly associated with an increase in lifespan," which differs sharply with the findings of the Purdue paper. However, the UGA researchers concurred that spaying/neutering increased the risk of death from cancer. The authors (Hoffman, Creevy, Promislow) believe that we need more research on the affects of reproductive ability on lifespan and the relationship between reproductive physiology and the specific cause of death.[22]

A highly footnoted research paper authored by Dr. Annette Smith, DVM, MS, of the Auburn University College of Veterinary Medicine, determined that gonadic hormones (estrogen, progesterone, testosterone) and their associated cellular hormone receptors may adversely or positively influence the development of canine and feline neoplasms (both benign tumors and metastatic cancerous tumors). Intact dogs will more commonly experience mammary tumors,

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[20] Torres de la Riva, Hart, Farver, et al., "Neutering Dogs: Effects on Joint Disorders and Cancers in Golden Retrievers," PLOS One, Feb 13, 2013.
[21] Hart, Hart, Thigpen, Willits, "Long-Term Health Effects of Neutering Dogs: Comparison of Labrador Retrievers with Golden Retrievers," PLOS One, July 14, 2014.
[22] Hoffman, Creevy, Promislow, "Reproductive Capability is Associated with Lifespan and Cause of Death in Companion Dogs," PLOS One, April 2013.

meningiomas, perianal gland tumors, prostatic tumors, and reproductive organ tumors. Non-neoplastic health conditions more common to intact dogs include pyometra, and vaginal prolapse. Moreover, owners of intact female dogs may be inconvenienced by unintended pregnancy, whelping complications, pseudopregnancy, and estral bleeding. On the other hand, sterilized animals were more likely to develop osteosarcoma, hemangiosarcoma, lymphoma, bladder cancer, and mast cell tumors.[23] In addition, according to Smith, pet owners and veterinarians should also weigh risks inherent to spay/neuter surgery, including anesthesia complications, hormone-responsive incontinence, perivulvar dermatitis, atrophic vaginitis, and endocrine alopecias.[2425]

Of particular note, Smith provided a critique relevant to the lifespan conclusion proffered by the UGA study. "Selection bias is prevalent in the veterinary literature…The pet population that is seen at a specialty hospital may not be representative of the general pet population…Pet owners who can not afford sterilization surgery may not be able to afford treatment when a serious disease condition occurs, resulting in a perception that those animals that are intact live a shorter time."[26]

There is also conflict regarding the effects of spaying/neutering on the development of behavioral disorders. Although many sterilization proponents and some researchers have cited the benefits of spaying/neutering in reducing roaming, marking, mounting, and dominance aggression in dogs (and spraying and aggressive behavior in cats),[27] other researchers have found behavioral detriments. A 2014 paper cited increased incidence of astraphobia (storm anxiety) and other behavioral disorders in spayed/neutered Vizslas.[28] A 2006 study of spayed female German Shepherds showed increased reactivity within the sterilized population.[29] A 1990 study asked owners to evaluate their dogs at approximately 6 months of age and again 6 months later. The study found that spayed females were more likely to demonstrate "indiscriminate appetite" and dominance aggression than females who were not spayed within the 6-month time period.[30]

In a number of the studies there were weaknesses pertinent to: 1) the method of data collection, which often were owner questionnaires that introduced great subjectivity and variability in

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[23] Annete N. Smith, "The Role of Neutering in Cancer Development," Vet Clin Small Anim 44 (2014).
[24] Ibid.
[25] SD Johnston, "Questions and Answers on the Effects of Surgically Neutering Dogs and Cats," JAVMA, 1991;198:1206-14.
[26] Annete N. Smith, "The Role of Neutering in Cancer Development," Vet Clin Small Anim 44 (2014).
[27] Richard Bowen, "Effects of Gonadectomy on Health, Behavior and Performance of Pets," Colorado State University, Dec 27, 2014.
[28] Zink, Farhoody, Elser, et al., "Evaluation of the Risk and Age of Onset of Cancer and Behavioral Disorders in Gonadectomized Vizslas," JAVMA, 2014;244:309-19.
[29] Kim, Yeon, Houpt, "Effects of Ovariohysterectomy on Reactivity in German Shepherd Dogs," Vet J 2006;172:154-9.
[30] O'Farrell, Peachy, "Behavioural Effects of Ovariohysterectomy on Bitches," Journal of Small Animal Practice, 1990 Vol. 31, No. 12, pp 595-598.

contrast to an optimal, controlled experimental design, 2) the consistency amongst physical or geographic environments between spayed and sterilized groups, and/or 3) the consistency amongst other variables, such as nutrition, owner finances, and owner behavior, that may have affected the dogs and thereby reduced the validity of the study outcomes. Nevertheless, there exists a volume of data that should prompt veterinarians and pet owners to take a more thorough look before immediately undertaking a spay/neuter operation, especially an early age spay/neuter, on a beloved pet, regardless of breed.

European Statistics and Policy

Interestingly, the public policy is very different in much of Europe, where the spay/neuter rate is much lower than in the USA. For instance, in Sweden only 7% of dogs are spayed/neutered.[31] In Hungary 43% of dogs are spayed or neutered.[32] In the United Kingdom 54% of dogs are spayed or neutered.[33] The sharpest difference from the USA lies in Norway. The Norwegian Animal Welfare Act forbids spaying or neutering, except in cases of medical necessity.[34][35] Yet, Scandinavian countries appear to have a much lower stray pet problem than in the USA,[36] most likely because the Scandinavian culture is such that people rarely abandon their pets or let them run loose.[37]

What is the Compromise?

In the 1970s approximately 24 million dogs and cats were euthanized in American shelters.[38] Due to vigorous public policy that promoted spay/neuter, shelter adoption, and overall more responsible pet ownership the number was decreased to 3.7 million by 2008.[39] Therefore, clearly spay/neuter promotion has assisted in reducing the slaughter of millions of overpopulated, unwanted dogs and cats.

Nevertheless, might there be a better way? Might there be a method that prevents breeding while simultaneously maintaining the overall potential health benefits of retaining testicular and ovarian function?

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[31] Jitpean, Hagman, Stom-Holst, et al, "Breed Variations in the Occurrence of Pyometra and Mammary Tumors in Swedish Dogs," Proceedings of the 7th International Symposium on Canine and Feline Reproduction (2012).
[32] Kubinyi, Miklosi, "Dog and Owner Demographic Characteristics and Dog Personality Trait Associations," Behavioural Processes, (2009).
[33] Diesel, Brodbelt, Laurence, "Survey of Veterinary Practice Policies and Opinions on Neutering Dogs," Veterinary Record, (2010).
[34] Live Kleveland Karlsrud, "Norwegian Animal Law," Michigan State University Animal Legal & Historical Center, (2004)
[35] Ida Kornellussen, "Should Dogs Be Neutered," Science Nordic, Dec 29, 2011.
[36] Ibid.
[37] Hal Herzog, "The Decision to Neuter Pets Just Got More Complicated," Huff Post Science, March 1, 2013.
[38] Ibid.
[39] "Animal Shelter Euthanasia," American Humane Association (2015)

The solution may be vasectomies and tubal ligations. With both procedures fertility is eliminated while the gonadic glands still produce pertinent hormones (testosterone, estrogen) that research shows is beneficial for optimizing long-term health.

Yet, there may be a huge impediment to implementing such a policy. Ted Kerasote, who actively promotes alternatives to spays and neuters, had his research assistant investigate the potential of alternative surgeries with 26 veterinary teaching colleges. Unfortunately, he found that not one of the 26 universities provides instruction on veterinary vasectomies and tubal ligations.[40]

Therefore, it stands to reason that few practicing small animal veterinarians are properly trained to perform the alternative surgeries. Consequently, despite the concerns registered by the recent research, pet owners will only have the choice to spay/neuter or do nothing, unless they are proximal to a board-diplomated veterinary surgical specialist, who feels comfortable completing a vasectomy or tubal ligation.

Summary

As the US population and demographics changed after World War 2 pet overpopulation became a serious problem in suburban and urban regions. Public policy responded by avidly promoting spay/neuter programs. The programs successfully inspired the vast majority of pet owners to sterilize their pets. Consequently, shelters euthanize significantly fewer dogs and cats.

However, recent academic research shows that orchidectomy and ovariohysterectomy, the most common surgical methods of sterilization, are potentially deleterious to the long-term health of dogs, such that the health benefits (such as the reduction in pyometra) and behavioral benefits (reduction in roaming, marking, and dog-dog conflicts between neutered and intact male dogs, usually instigated by the neutered dogs) are markedly outweighed by the increased health risks. Vasectomies and tubal ligations are surgical alternatives that may resolve the dilemma between responsible population control and public policy on one end and the long-term health of our beloved pets on the other end. Yet, few practicing small animal veterinarians are properly taught to administer vasectomy or tubal ligation surgeries and board-diplomated surgeons may be outside the financial or geographic means of many pet owners.

Therefore, pet owners should pressure veterinarians, veterinary associations, and veterinary colleges to become familiar with alternative surgeries, so that citizens have an educated and available choice when adopting or purchasing their next pet. At times spaying or neutering may remain the superior election, especially if the surgery is postponed until the growth period has ceased. However, at other times vasectomy or tubal ligation or no surgery at all may be a better decision. Regardless, education of the pet owning population and education of the veterinary community will lead to more informed action, better long-term health for our pets, and a more humane public policy.

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[40] Dr. Martin Becker, "Two Possible Reasons Dogs Live Longer in Europe," Healthy Pets, September 6, 2011.