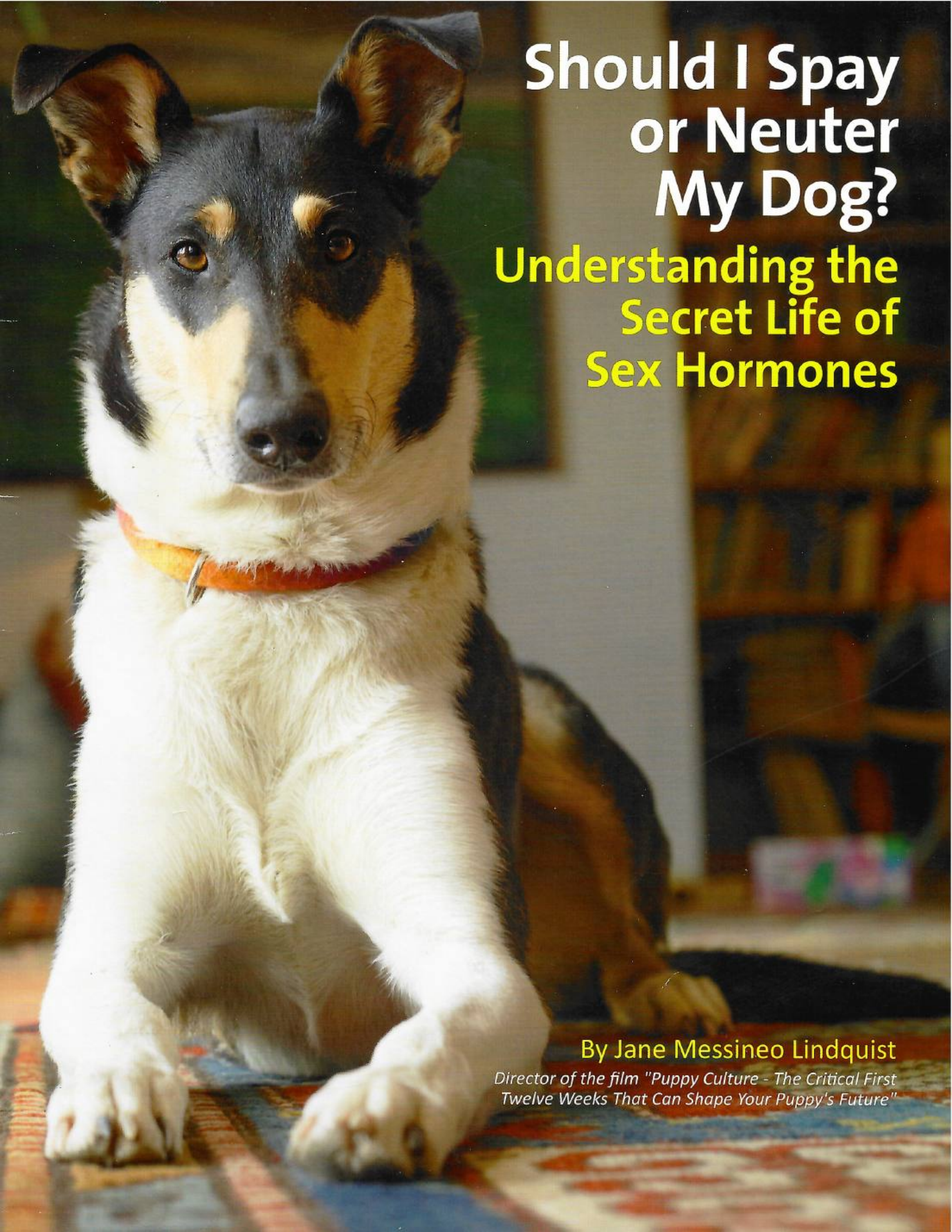


Should I Spay or Neuter My Dog?

Understanding the Secret Life of Sex Hormones

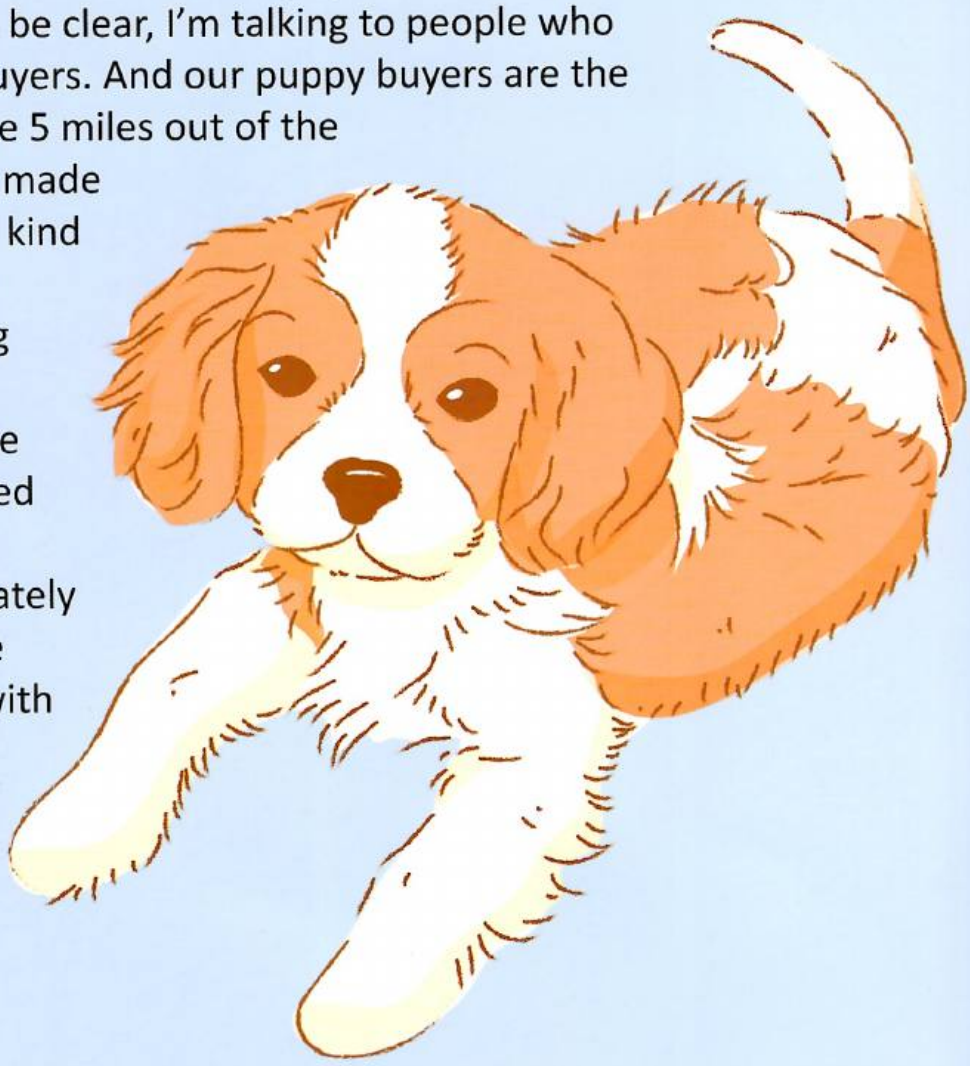
By Jane Messineo Lindquist

Director of the film "Puppy Culture - The Critical First Twelve Weeks That Can Shape Your Puppy's Future"

Spaying and neutering are major surgeries that remove important organs, yet most pet owners agree to the procedure as a matter of course. Is that always the best choice? We wrote this booklet to help you decide.

Who Are You, Anyway?

The problem with almost all spay/neuter advice is that it's almost never qualified based on the audience it's intended to reach. The "correct" advice will be VERY different based on the demographics and values of the pet owner. So, let's be clear, I'm talking to people who are like our own puppy buyers. And our puppy buyers are the kind of people who'll drive 5 miles out of the way to pick up dog treats made from grass-fed bison. The kind of people who have bath towels that are unraveling but will pay double for a dog bed because it's made of organic cotton harvested in the U.S. The kind of people who post immediately to Facebook the first time their puppy takes a nap with them. With a selfie.
You know who you are.



Your Dog is Not Part of the Problem

The most often touted argument in favor of spay/neuter is animal overpopulation. You may disregard this argument as it does not apply to you.

Let's talk, here. You would never open the back door and just let your dog run free by himself outside of a fenced enclosure. In fact, it's possible you have consulted an animal communicator about what color stain your dog would prefer on his privacy fence. Your dog is not going to be roaming around the neighborhood and creating/having unplanned pregnancies. Forget the atomic guilt trip and hipster peer pressure at the dog park. Pet overpopulation is never, ever, a good reason for someone like you to neuter your pet.



Dog behaviors that may seem obviously and simply sexual to us often are not. "Humping" in dogs is a complex behavior that can serve a variety of functions from stress displacement to an invitation to play.

Cutting To The Chase

I know you've heard that spay/neuter is "healthier" for your dog but, with precious few exceptions, that's not the case. After reading hundreds of studies and every retrospective review of the evidence we could get our hands on, we could not find any significant evidence that spay/neuter is in any way good for your dog's overall health. In fact, spay/neuter appears to be strongly associated with poorer overall health for your dog. And many of those health risks are greatly increased if the spay/neuter is done at a young age.

Yes, there are some major disorders that might be prevented by spay/neuter, and we will consider each of them carefully. But we feel that there are such good options for treating and managing the risks of those disorders that spay/neuter, especially before middle age, is not an overall health benefit.

Furthermore, while spay/neuter may help improve a select few behaviors that are sexually driven, the behaviors that pet owners have trouble with are almost never sexually driven.

Even things that might seem to us to be sexual (such as humping) most often are not. And spay/neuter *might* increase dog aggression, stranger aggression, and even owner-directed aggression.

But I Want To Be A GOOD Pet Owner!

If you're like most people in the United States, you're probably having a really hard time believing what you just read. You've gotten the message loud and clear from everyone from your vet to your dog trainer that spay/neuter is the "right" thing to do for your pet, to the point where it's part of the moral and cultural fabric of this country. Hang your head low if your dog has testicles and avert your gaze from passersby if you take out your bitch in her "season" pants. You are being judged by everyone who sees you, and their opinion is not favorable.

But did you know that, throughout much of Europe, dogs are almost always left intact and elective spay/neuter is seen as unethical? For a while, Norway even made it illegal to spay or neuter your dog unless there was a medical necessity to do so. In Sweden, fewer than 7% of



In Europe, dogs are rarely neutered yet they are allowed to go everywhere. Note the lack of problems this causes for anyone in European restaurants.

dogs are spayed/neutered, yet the data seems to indicate that Swedish dogs live as long or longer than dogs in the United States. Furthermore, in most of Europe, dogs go everywhere, including public transportation, stores, and restaurants, so clearly being intact is not a public safety issue. This is living proof that "routine" spay/neuter is not necessarily something to be proud of.

Does This Make Me A Bad Person If I Spay or Neuter My Dog?

Not at all. There are quality of life issues to be addressed and each case is unique with its own individual considerations. Make no mistake, in those instances where a problem behavior really is sexually driven, we believe that quality of life and enjoyment of your pet are paramount and you shouldn't feel bad about spay/neuter in those cases. Your lifestyle with your pet counts, too - if your dog is going to miss out on enriching and bonding experiences because of his or her sexual status, that's a perfectly good reason for you to spay or neuter your dog. But you need a good understanding of what altering your animal will and will not accomplish behaviorally before you make that choice, and you also need to consider how and when to alter your dog so that it will have the least negative impact on his health.

We're going to talk about all those factors and also take a fairly critical look at the evidence. But what we want to shake out of you before you dive into the rest of this book is the reflexive notion that altering your dog is somehow healthier or the morally right thing to do, because it's not.

What's Inside This Booklet

We'll begin with how and why spay/neuter affects your dog's health (page 4).

Then we'll look at how spay/neuter might change your dog's behavior (page 20).

We'll help you decide if you should spay or neuter your dog (page 26).

Lastly, we've included a list of selected references (page 33) so you can dive into the research on your own if you wish!

I'm In A Hurry, Could You Sum It Up?

Sure! We've got you covered with the following infographics:

- What Spay/Neuter Does To Your Dog's Health (page 4)
- The Impact of Spay/Neuter on Your Dog's Behavior (page 20)
- The Effect of Age At Time of Spay/Neuter (page 27)

The infographics will give you the facts, but the rest of the book will give you the WHY of the facts, which is essential to good decision making, so read on!

Part One: Your Guide to the Health Consequences of Spaying and Neutering

Why Spay/Neuter Has So Many Negative Health Consequences

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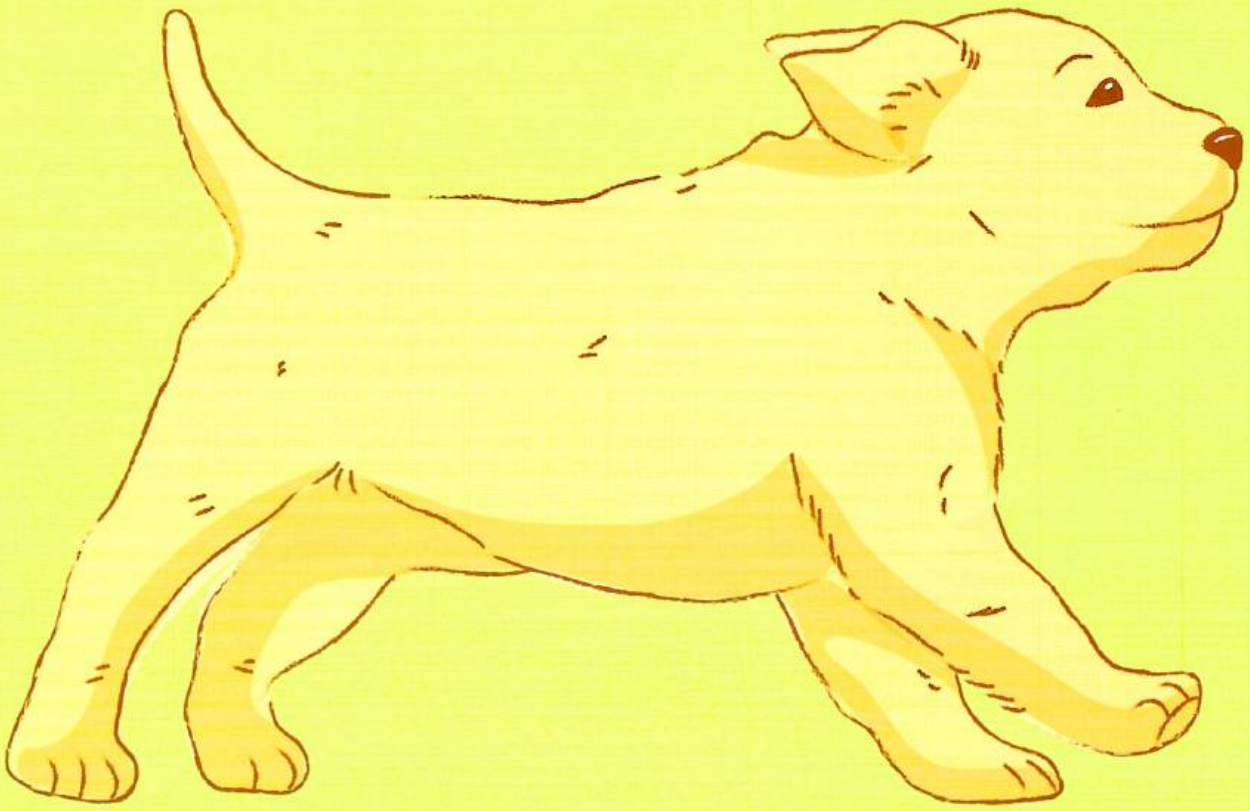
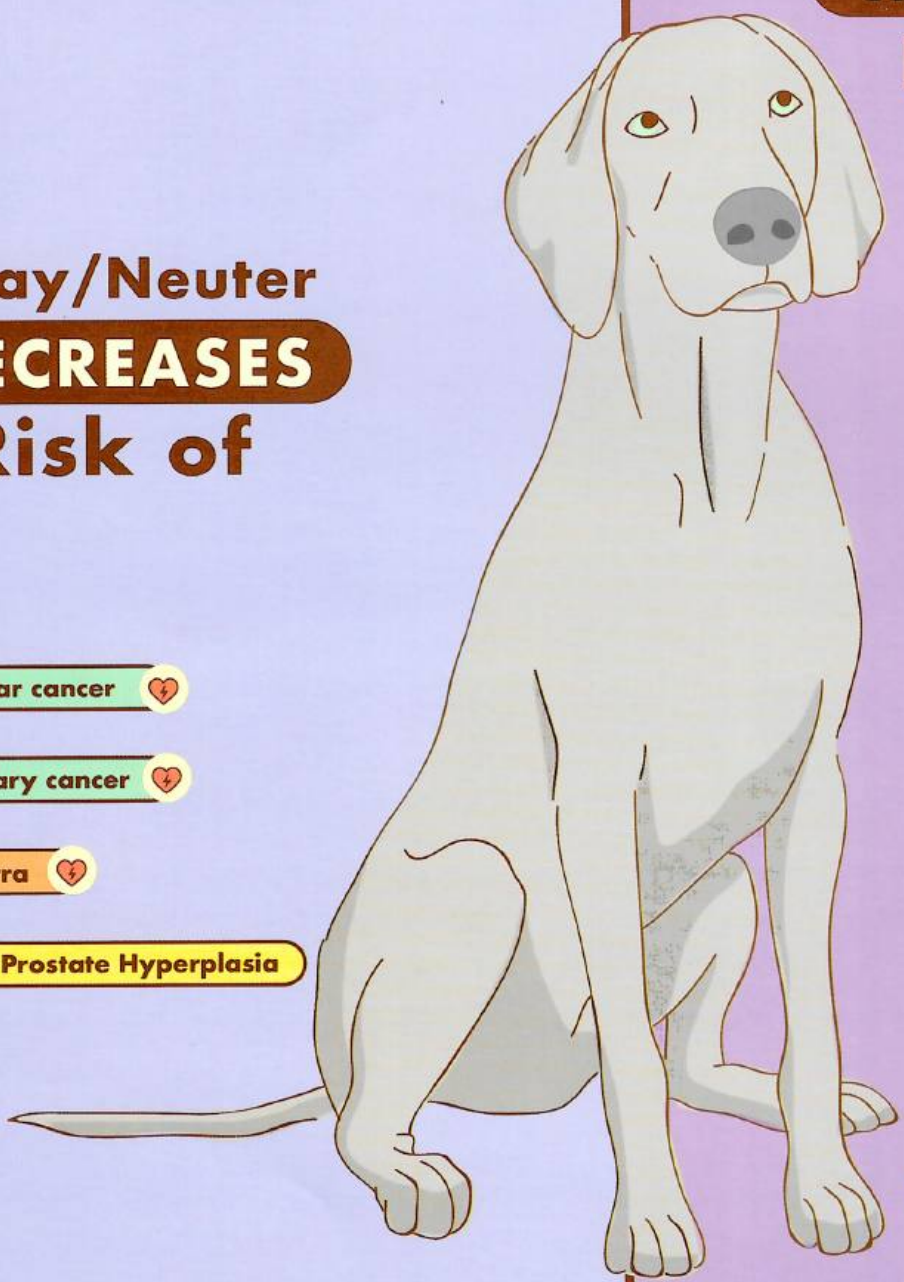


WHAT SPAYING / NEUTERING Does to Your Dog's Health



Spay/Neuter DECREASES Risk of

- Testicular cancer
- Mammary cancer
- Pyometra
- Benign Prostate Hyperplasia

Spay/Neuter INCREASES Risk of

- Mast cell tumors
- Cancerous heart tumors
- Cancerous spleen tumors
- Prostate cancer
- Bone cancer
- Bladder cancer
- Lymphoma
- Hip dysplasia
- Cruciate ligament tear
- Hormonally mediated bladder infection
- "Spay" incontinence
- Immature vulva chronic bladder infection
- Hypothyroidism
- Diabetes
- Adverse reactions to vaccines
- Obesity
- Unmanageable coat

Legend

- cancers
- orthopedic issues
- female urinary & reproductive issues
- endocrine and immune disorders

Life threatening

Clear As Mud?

Making Sense of Conflicting Information

Take a look at the infographic on the facing page. Do you find it puzzling? How can spay/neuter both prevent and cause cancer? How can it improve some behaviors and make others worse? How can early spay/neuter reduce the risk of some diseases and increase the risk of others?

It's not as complicated as it looks if you understand the role the testicles and ovaries play, and how removing them affects your dog. So let's take a look at what happens to your dog's system when you spay or neuter and why altering your dog has a particular physical or behavioral effect.



Altering Actually Does Alter The Animal

Why Spaying/Neutering Has So Many Negative Health Consequences

The connection between sex organs and everything from cancer to immune disorders may at first seem surprising. This is because we humans have arbitrarily reduced testicles and ovaries to one function and made that function shameful. So people feel they're cleansing their dogs of a "dirty extra part" when they spay/neuter. But this is simply not true. "Sex" hormones are the boss and they keep everything, from bones to blood sugar, running smoothly.

We'll talk more about the endocrine system (the collection of organs that produce hormones) on page 10, but for now just let it soak in that testicles and ovaries are not just reproductive organs. They're important players in the endocrine system that help maintain healthy body functions and growth.

Hormones Are Serious As Cancer

Non-Reproductive Cancers

What does sex have to do with cancer? Apparently a lot. Exactly how and why sex hormones can have a protective effect against certain types of cancer is not fully understood, but one theory is that spay/neuter removes the negative feedback to the hypothalamus which results in a supraphysiologic circulating concentration of LH which may cause long-term health complications mediated by LH receptor activation in non-reproductive tissues. *Yikes. What?*

Here's what it breaks down to, without the horrendous science-speak:

The hypothalamus gland is constantly worrying about sex. Specifically, fertile sex. It obsessively scans the body for levels of sex hormones (estrogen and testosterone). The hypothalamus gets very nervous when it "pings" for sex hormones and there are not enough sex hormones to give it decent feedback. The hypothalamus starts wringing its hands and furiously dumping GnRH into the bloodstream - a hormone which tells the pituitary gland to wake

the heck up and send out a search party for sex hormones.

The pituitary rubs the sleep out of its eyes and starts pumping out streams of a hormone called LH. LH pokes the testicles or ovaries with a stick and tells them to get to work producing testosterone or estrogen.

In an intact animal, the testicles or ovaries hear the LH's "all hands on deck" message, and send out a burst of testosterone or estrogen.

As soon as there's enough testosterone or estrogen circulating in the bloodstream to "answer" the hypothalamus, the hypothalamus takes a deep breath and cuts its engines. This stops the production of GnRH which, in turn, tells the pituitary gland that it can take a rest and stop making LH. All is well again, for now.

But when you remove the testicles or ovaries, the body has no way to make sex hormones, so the hypothalamus never gets a response when it calls. The poor hypothalamus continues to spin out in a frantic and futile call for sex hormones, dragging the pituitary along with it, and they go off the rails making GnRH and LH. In fact, spayed/neutered animals have more than thirty times the LH concentrations found in intact adult males and bitches.

Okay, so big deal. There's a lot of LH in altered animals. What does that have to do with cancer? Well, there are all kinds of tissues in the body that have LH receptors, and the thought is that these extremely high levels of LH may stimulate cells in these areas to divide out of control and become cancerous. In the same way that you might have heard that certain types of breast cancer can be estrogen sensitive, there is thought that many types of cancer could be LH sensitive. Which would explain the significant rise in all kinds of non-reproductive cancers after spay/neuter. So there's that.

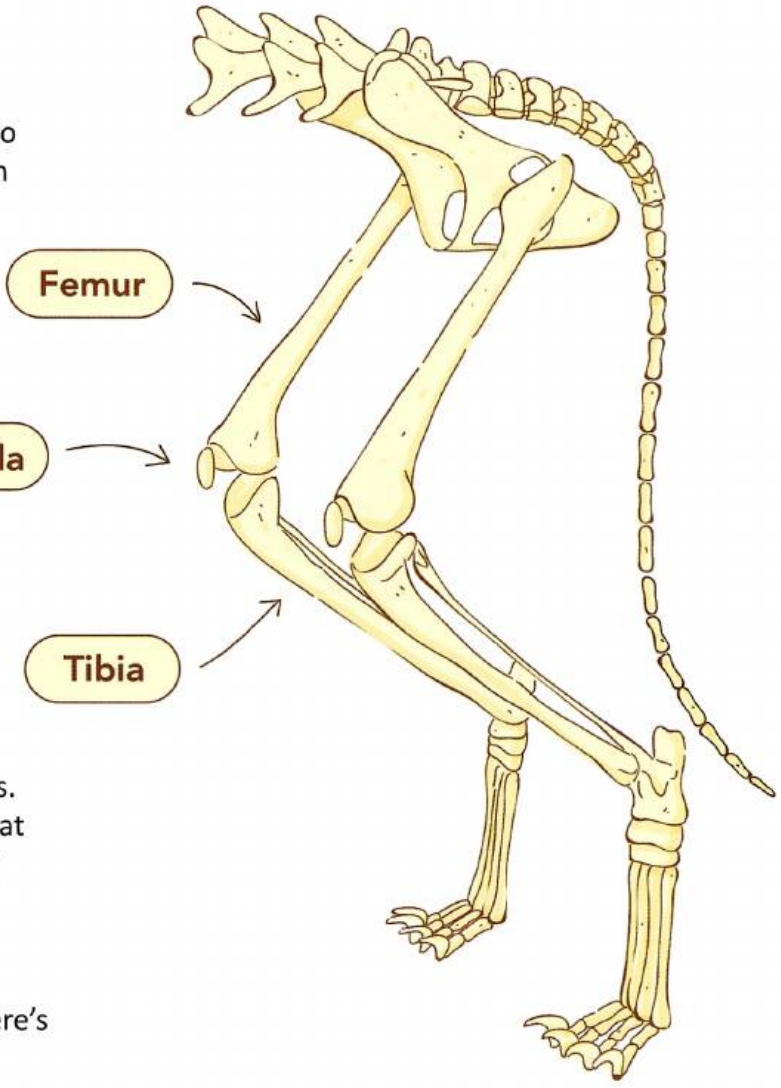
Keep Your Eye On The Ball

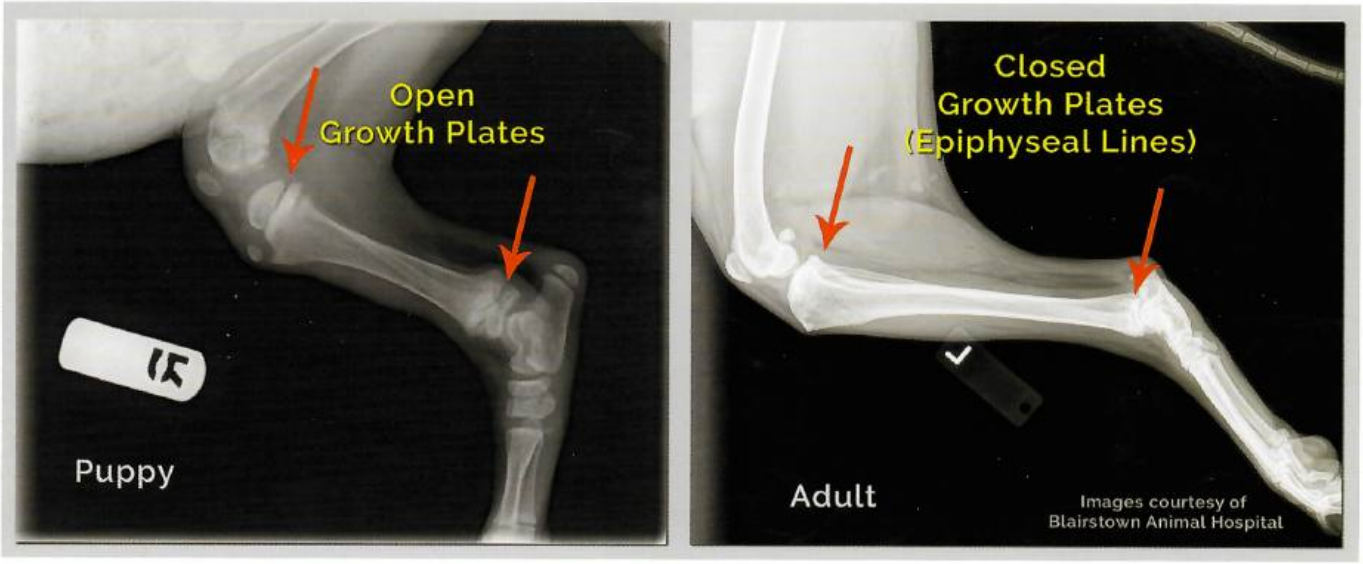
Prostate Cancer

Somehow, there is a popular notion that neutering dogs prevents prostate cancer when the exact opposite is true. Neutering has been found to increase the risk of prostate cancer eightfold.

Some of the confusion could be because neutering reduces benign (non-cancerous) prostate hyperplasia (BPH). BPH is a manageable condition that we will talk more about later.

Avoiding BPH is in no way a good trade off for increasing the risk of prostate cancer, so neutering is not a winner in the prostate department!





Hormones and Funny Bones

Orthopedic Concerns

Puppy bones grow from soft areas on either end of each bone. These areas are called "growth plates." They contain rapidly dividing cells that allow bones to become longer until the end of puberty. Growth plates gradually turn into bone as hormonal changes during puberty signal the growth plates to close. In puppies, this closure is normally completed by approximately 18 months old.

So what happens when you remove the testicles or ovaries on a dog before his or her growth plates close? Without sex hormones to "tell" the growth plates to close, the bones grow at abnormal rates and/or the growth plates stay open longer, allowing some bones to grow out of proportion with the others.

Why should you care? Aren't "proportions" just a fussy "dog show" thing? Unfortunately, form really does follow function - when bones grow out of proportion, orthopedic problems often follow. For instance, the tibia will grow proportionately much longer in an early neutered dog versus an unneutered dog. This changes the angle and proportion of the tibia to the femur (see illustration on facing page). Some scientists think this is why your dog is a lot more likely to need expensive and very painful cruciate ligament surgery if he or she is altered before their growth plates close.

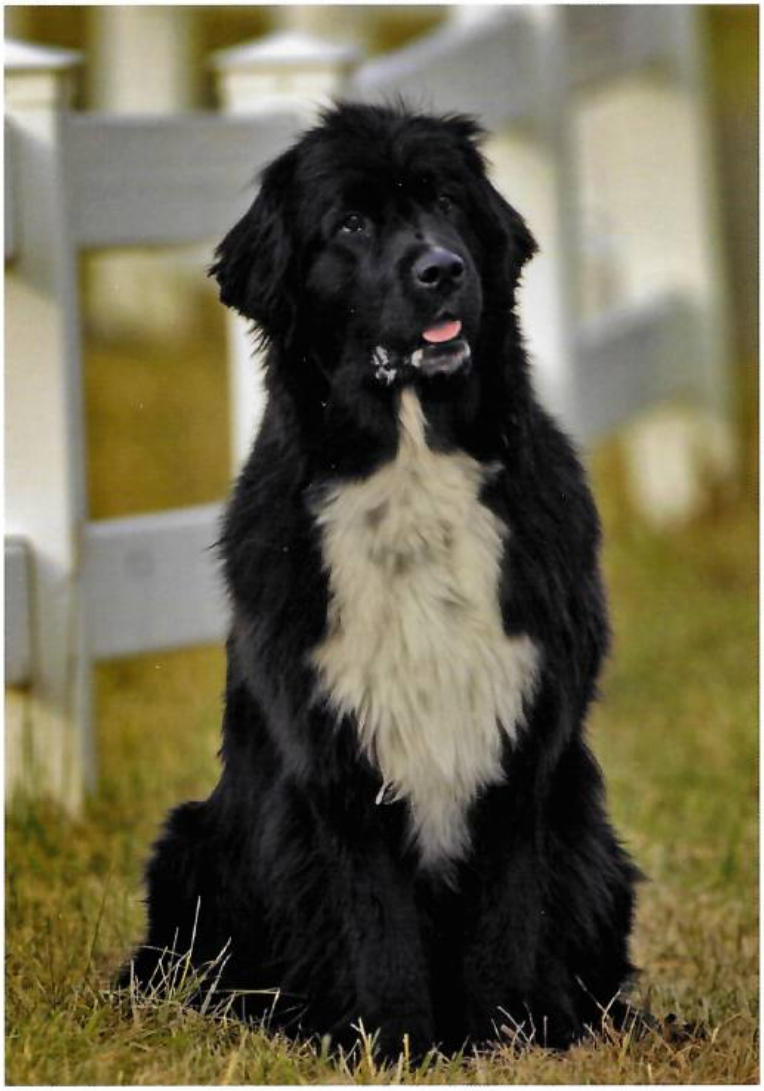
But even dogs neutered after puberty have been found to be more likely to need cruciate surgery. The reasons for this have not yet been studied, but it could be because the hormones estrogen and relaxin play a key role in maintaining tone of the cruciate ligament. Neutering at any age reduces these hormones and therefore could potentially affect the functionality of the cruciate ligament.

Hips Don't Lie

Hip Dysplasia

Dogs who are spayed or neutered also have a higher risk of developing hip dysplasia - and puppies who are spayed or neutered young have a particularly high risk. As of the time of this writing the reasons for this have not been conclusively proven. But the theory is that the same factors of delayed growth plate closure and uneven bone growth contribute to the problem. The fact that animals neutered under 5.5 months old were found to have a particularly high incidence of hip dysplasia does seem to support the idea that early spay/neuter causes growth disruptions that can create abnormalities in joints.

It is worth noting that the risk of a dog developing hip dysplasia varies wildly depending on breed. In the case of mixed breed dogs, stocky body type and large size are risk factors for hip dysplasia. So the increased risk of hip dysplasia will be more relevant to some pet owners than others.



Hip dysplasia affects all shapes and sizes of dogs. However, mixed breed or purebred, if your dog is a "big dog," with a stocky body type, then you should be especially cautious about spay/neuter before growth plate closure!

Ur-ine Trouble Without Hormones

Urinary Tract Issues and Incontinence

There is plenty of research on "spay incontinence" in bitches no matter at what age they are spayed. It seems that lack of estrogen after spaying can cause a variety of urinary problems, from lack of bladder tone to increased risk of bladder infections.

What's interesting is that there seems to be little or no research on the role of estrogen and house training. We have noticed over the years that there is a decent percentage of female puppies who appear to have an inability to hold their urine until having one or two seasons. These same bitches almost magically become perfectly house trained immediately following their first or second season. Could this be the effect of sex hormones influencing bladder tone? We're not sure exactly why, but from our observation and experience, allowing a bitch to go through a season or two appears to positively affect her ability to be house trained.

In addition to the issues created by lack of estrogen, spaying very early (before a bitch has a season or two) also can result in a permanently immature vulva, which will be prone to chronic bladder infections. The immature vulva is "hooded" (recessed) which traps urine, therefore creating bacteria that leads to bladder infections.

Fat Chance Without Hormones

Obesity and Spay/Neuter

Spaying or neutering is the single biggest risk factor for your dog becoming obese. The poor things get hit with a double whammy - their metabolic rate goes down and their hunger goes up.

And it's not just in their heads; altering them really does cause them to produce less of the hormones (cholecystokinin and glucagon) that make them feel full after eating. So their daily caloric requirement goes down by an average of 30%, but left to his own devices, the average dog will increase his caloric intake by 20% within one week of being spayed or neutered.

Sure, you can exercise your pet more and cut back his food by 30% instead of allowing him to increase his food intake by 20%. That means your dog will be eating about 50% less than he would like to eat in order to feel "comfortable." That will leave him in a perpetual state of discomfort and hunger which few pet owners have the heart to force their beloved friend to endure. Is it any wonder that 68% of spayed and neutered pets have been classified as obese?

And of course, the risk of all the orthopedic problems, such as hip dysplasia and cruciate injuries, are greatly increased in obese dogs. Those injuries cause dogs to move less, which in turn ratchets down their caloric needs, which makes them more obese... and the dog gets caught in a no-win obesity-injury cycle.

Forgetful Fido

Canine Dementia and Spay/Neuter

One small study indicated that neutered males had a significantly quicker cognitive decline than intact males. The thought is that testosterone has a protective effect against cognitive decline - indeed, testosterone has been shown to have a neuroprotective effect against Alzheimer's disease, mild cognitive impairment, and depression in humans.

The study hypothesized that estrogen would have a similar protective effect for bitches BUT the study did not include any intact bitches so the effect in females remains unproven. It's worth noting, however, that the link between estrogen and maintaining cognitive function has been well established in humans.

The study of the relationship between canine dementia and neutering probably did not involve a large enough number of dogs to conclusively say whether or not neutering increases the chances of canine dementia. However, we still feel it's a significant study that dog owners should pay attention to, due to the overwhelming evidence from human studies which show that sex hormones protect against dementia.

Throwing a Wrench In The Works

Spay/Neuter and Immune and Endocrine Disorders

Remember, sex hormones are involved in manifold functions, from producing chemicals that help the animal handle stress to regulating blood sugar, skin, hair, and bone growth. So it's not surprising that studies have found that spayed/neutered animals are much less able to cope with stress and have a higher incidence of immune- and endocrine-related diseases.

The endocrine system is a collection of organs throughout the body that make chemicals (hormones) that control the various functions of cells, tissues, and organs. We talk a lot more about the endocrine system on page 10, but for now just understand that when we talk about "endocrine disorders," we mean diseases that result from insufficiency, excess, or imbalance of the various hormones that the organs in the endocrine system produce.



Testosterone and estrogen may play a key role in keeping your senior dog's mind sharp as they age!

The correlation between spay/neuter and endocrine diseases is significant. A 2016 study of 91,000 dogs over a fifteen year period found that spay/neuter increased the risk of the following:

- **Hypothyroidism.** While not in itself a life-threatening disorder, the symptoms of hypothyroidism - weight gain, slowed heart rate, sluggishness, ear and toenail infections, hair loss - can significantly affect quality of life.
- **Eczema** (Atopic dermatitis)
- **Autoimmune hemolytic anemia.** The dog's immune system attacks its own red blood cells, causing anemia and life-threatening complications.
- **Canine myasthenia gravis.** A disorder of the signals between nerves and muscles resulting in muscle weakness and excessive fatigue.
- **Colitis.** Inflammation or irritation of the colon or large intestine.
- **Addison's Disease.** A condition where the immune system destroys the adrenal gland, causing the dog to be unable to produce cortisol, which is the hormone necessary to regulate many body functions and cope with stress.
- **Immune-mediated polyarthritis.** The canine equivalent of rheumatoid arthritis.
- **Immune-mediated thrombocytopenia.** A condition where the immune system attacks its blood platelets, causing anemia and the inability of blood to clot.
- **Inflammatory bowel disease**
- **Pemphigus complex.** A skin condition which causes sores and blisters.
- **Lupus** (increased risk in bitches only)

In addition, diabetes has been long known to be higher in spayed/neutered dogs. Some have argued that this is due more to spay/neuter-related obesity than actual endocrine disorders. Either way, spay/neuter appears to increase the risk of diabetes.

Balancing On A Three Legged Chair

A Brief Explanation of How Spay/Neuter Affects the Endocrine System

The previously discussed 2016 study specifically reserved the question of WHY spay/neuter is associated with a higher risk for endocrine and immune disorders. However, an understanding of the endocrine system and how it works is helpful in understanding why spay/neuter might have such far-reaching negative consequences.

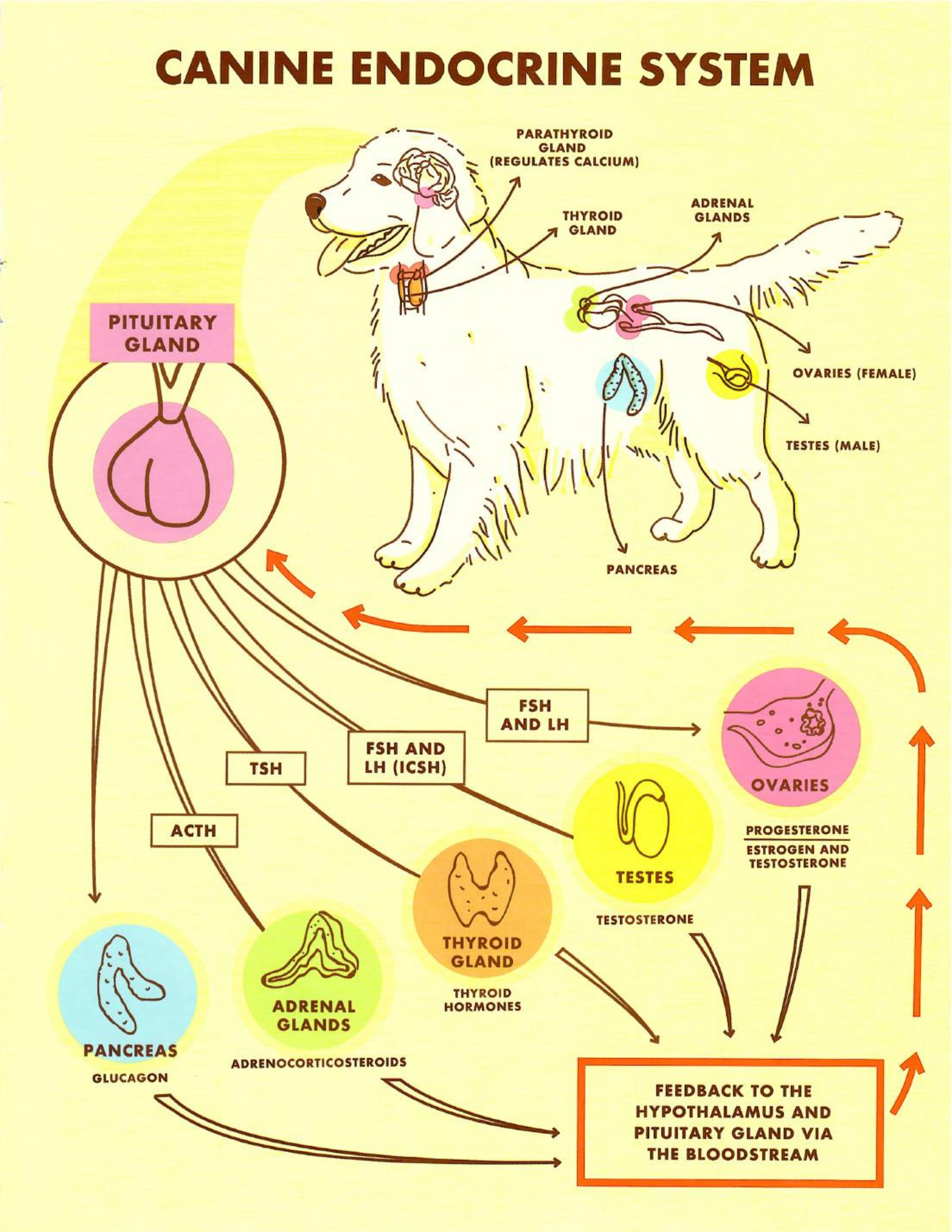
The endocrine system is comprised of all the glands that produce hormones, which regulate the function of cells, tissues, and organs:

- **Pituitary gland**
- **Thyroid gland**
- **Parathyroid gland**
- **Pancreas**
- **Adrenal glands**
- **Testicles/ovaries**

What's crucial to know is that the endocrine system is known as a "chemical messenger system" because the glands are continually "talking" to each other about hormone levels and working together to keep hormone levels in balance. There's a continual stream of chemical messages flowing within the endocrine system which, when everything is working correctly, maintains optimal health.

The diagram on the facing page represents only an introduction to the "players" in the endocrine system, as well as the most basic idea of the feedback loop within the endocrine system. In actuality, the messages, interplay, and feedback loops between all the different parts of the endocrine system are so complex (and fascinating) that it would take volumes to even begin to explore.

CANINE ENDOCRINE SYSTEM



Suffice it to say, however, when you pull out a major player such as the ovaries or the testicles from the endocrine system, it's like kicking one of the legs out from underneath a chair. Everything is thrown out of balance. The endocrine system may call on one of its glands or another part of the body to make the missing hormones as it desperately tries to maintain an even keel, but that can have manifold health consequences, including overtaxing the remaining parts of the endocrine system and flooding the body with "message" hormones which could have negative consequences (recall the LH-cancer theory on page 6).

Bottom line, it's definitely not "helpful" to yank out a portion of the endocrine system, and that is what's occurring when you spay/neuter your dog.

Sticking It To Neutered Animals

Vaccine Reactions

One study found that neutered animals were 27-38% more likely to have adverse reactions to vaccines than intact animals. As of the time of this writing we are unaware of any study that investigates the cause of the link between spay/neuter and vaccine reactions. All we know is that there appears to be an increased risk, particularly for spayed/neutered young adult, small breed dogs.

Just to be clear, body size, age, and number of vaccines given at one time had as much or more of an influence on whether or not a dog had an adverse reaction than did the dog's spay/neuter status. Furthermore, the actual overall risk of a dog having a reaction to a vaccine is quite small, ranging from about 1% for small breed dogs to about 1/10th of 1% for large breed dogs. So reaction to vaccines itself is probably not a big consideration when it come to spay/neuter.

I do think the fact that there is proportionately such a large increase in vaccine reaction risk (even though the risk is small) is a possible indication of a larger underlying problem and supports the evidence that spay/neuter is a contributing factor in a whole host of immune and endocrine disorders.

The Flip Side

How Spay/Neuter May Decrease Certain Health Risks

There ARE some specific instances where spaying/neutering has a potentially life-saving health benefit, and you have to weigh those benefits against the risk of neutering. To recap, spayed/neutered animals have a lower or no risk of the following:

1. Infection of the uterus (pyometra)
2. Possibly mammary cancer
3. Uterine cancer
4. Testicular cancer
5. Benign (not cancerous) prostate tumors

I'll tip my hand here and tell you that there are options to manage every one of these risks to the point that we do not feel routine spay/neuter, especially before middle age, is ever justified as a health "benefit." But you still definitely have to negotiate the waters of risk and benefit for your particular dog, so read on!

Womb of Doom?

Uterine Infections (Pyometra)

Bitches come into season and ovulate on average once every 6 to 12 months. The hormone progesterone is what triggers ovulation. Progesterone also has the effect of "roughening" the walls of the uterus, which can create a host environment for an opportunistic infection, called a "pyometra" or uterine infection. Each season damages the walls of the uterus just a little bit more, making it more likely that a bitch will contract pyometra as she ages.

Pyometra is nothing to be trifled with - it can be life threatening and sometimes asymptomatic for a long time until the bitch is seriously ill. Pyometra can't be treated just with antibiotics - your bitch will either have to undergo an emergency spay when she's already in a debilitated condition or have extensive hormone therapy to eliminate the infection.

Likelihood of Developing Pyometra by Ten Years Old

LESS LIKELY

0 - 10%

- Coton de Tulear
- East Siberian Laika
- Finnish Spitz
- Gordon Setter
- Lancashire Heeler
- Maltese
- Norrbotten Spitz
- Saluki
- Tibetan Terrier

11 - 20%

- Afghan Hound
- Basenji
- Beagle
- Bearded Collie
- Bedlington Terrier
- Bichon Frise
- Border Collie
- Briard
- Dalmatian
- Danish/Swedish Farmdog
- Dachshund (long-haired)
- English Pointer
- Finnish Hound
- Finnish Lapphund
- German Jagde Terrier
- German Longhaired Pointer
- Greyhound
- Hamilton/Swedish Hound
- Havanese
- Icelandic Sheepdog
- Irish Soft Coated Wheaten Terrier
- Jack Russell Terrier
- Karelian Bear Dog
- Miniature Pinscher
- Norwegian Buhund
- Norwich Terrier
- Papillon
- Papillon Drop Ear
- Pomeranian
- Rhodesian Ridgeback
- Schiller Hound
- Shiba Inu
- Shih Tzu
- Siberian Husky
- Smaland Hound
- Swedish Vallhund
- Tibetan Spaniel
- Welsh Terrier

SOMEWHAT LIKELY

21 - 30%

- Basset Artesian Normand
- Border Terrier
- Borzoi
- Boxer
- Cairn Terrier
- Chihuahua (long-haired)
- Chihuahua (smooth-haired)
- Drever
- Elkhound
- English Setter
- Flat Coated Retriever
- German Spaniel
- Groenendaeler
- Hovawart
- Irish Setter
- Japanese Spitz
- Kelpie
- Labrador Retriever
- Lhasa Apso
- Mixed breed
- Munsterlander
- Novia Scotia
- Duck Tolling Retriever
- Norfolk Terrier
- Petit Basset Griffon Vendeen
- Schipperke
- Shetland Sheepdog
- Toy Poodle
- Welsh Springer Spaniel
- West Highland White Terrier
- Whippet
- Yorkshire Terrier

31 - 40%

- Alaskan Malamute
- American Cocker Spaniel
- Belgian Shepherd Dog
- Chinese Crested Dog (Powder Puff)
- English Cocker Spaniel
- English Springer Spaniel
- Herman Shepherd Dog
- Golden Retriever
- Large (Standard) Poodle
- Samoyed
- Swedish Elkhound
- Swedish Lapphund
- Swiss Hound/Lucerne

FAIRLY LIKELY

41 - 50%

- Airedale Terrier
- Basset Hound
- Bouvier des Flandres
- Cavalier King Charles Spaniel
- Collie
- Doberman
- Old English Sheepdog
- Newfoundland
- Pug
- Pyrenean Mountain Dog
- Scottish Terrier

51 - 60%

- Bernese Mountain Dog
- Bull Terrier
- Great Dane
- Irish Wolfhound
- Keeshond
- Leonberger
- Rottweiler
- Staffordshire Bull Terrier

Jitpean, S., Hagman, R., Ström Holst, B. S., Höglund, O. V., Pettersson, A., & Egenvall, A. (2012). Breed variations in the incidence of pyometra and mammary tumours in Swedish dogs. Reproduction in Domestic Animals, 47, 347-350. Doi: 10.1111/rda.12103

It's important to understand that young puppy bitches will sometimes have vaginal discharge, known as "puppy (juvenile) vaginitis." This is very common and is not pyometra. It's an inflammation of the vagina that can sometimes cause some cloudy discharge. Typically it resolves itself without treatment as the puppy's immune system matures. I'm sad to say that some vets do not know the difference between the two, and they will advise you to spay your 12 week old puppy because she has pyometra when in fact it's simply puppy vaginitis.

If you're scared by this, you should be! Spaying *will* prevent pyometra - but before you run for the knife, take a deep breath and keep reading.

The actual risk of a bitch developing pyometra varies TREMENDOUSLY by breed - so much that there is no one best practice when it comes to pyometra and spaying. A huge study of 260,000 bitches indicated that the risk of developing pyometra by ten years of age varies from 5% (Finnish Spitz) to 66% (Bernese Mountain Dog). Based on the available data, on the previous page you'll find an infographic to help you understand where your breed falls on the risk matrix.

Keep in mind this is a VERY general starting point and you should read the available studies (cited at the end of this booklet) and speak to your breeder; there are different lines within breeds and your breeder's experience with their lines may be your best guide to the real risk of your bitch developing pyometra.

So if you're in a breed where the risk is super low, maybe you want to think about all the health benefits of not spaying and just monitor your bitch closely for signs of pyometra.

Even if you have a high-risk breed where you definitely want to spay non-breeding bitches, you might weigh the risk of early spay against the actual risk of pyometra. Pyometra usually (but not always!!!) requires the cumulative effect of a few seasons to create a host environment for disease, so there's an argument here for at least waiting a couple of seasons before spaying even a high risk-breed.

See the section on "Having Your Cake and Eating It Too" on page 28, where we discuss ovarian sparing spay. By removing the uterus and keeping the ovaries, you maintain the protective effect of sex hormones without the threat of pyometra.

If you have a mixed breed dog, your choices are more difficult. Pyometra is of course a concern, but you unfortunately don't have as good a compass as to how big a concern it should be. While we cannot recommend very early spay, a spay by middle age is a reasonable course of action. Middle age will be determined somewhat by the individual dog, but somewhere around 6 years old is a good rule of thumb.

Uter-In Or Out?

Uterine Cancer

Just a short note about uterine cancer - yes, removing the uterus prevents uterine cancer, but uterine tumors are considered a very rare occurrence in dogs. Uterine tumors only account for 0.4% of all tumors found in dogs. But this still has to go in the "pro-spay" column!

Zero Sum Game

Canine Mammary Tumors

Of all the health considerations regarding spay/neuter, mammary cancer is the one that presents the biggest conundrum. In the same way that the high levels of LH post-spay may increase non-reproductive cancers, the higher estrogen levels of an intact bitch may promote mammary cancer. So you really can't get a 100% win with this one - you're going to either increase your dog's risk of non-reproductive cancer or mammary cancer, no matter which way you go.

It literally comes down to looking at your breed, and even the lines *within* your breed,

and deciding whether your dog's risk of a non-reproductive cancer (for instance, bone cancer) or other fatal disorder is worse than your dog's risk of mammary cancer. So let's talk about risk factors and management strategies.

There's a long-held belief that spaying has a protective effect against mammary cancer. However, the studies supporting this belief have been called into question lately, casting some uncertainty on the topic. Here's a round up of what we think you should know:

- Anecdotally and in our own experience, mammary tumors do seem to be more common in middle-aged bitches who were not spayed at a young age (under a year old).

- Generally, the studies indicate that the biggest benefit comes from very early spay (before the first season), although some studies indicate benefits continue to accrue even with later spay, after the bitch has had two or more seasons.

- Similarly to pyometra, the risk of a bitch developing a mammary tumor by age 10 varies wildly from breed to breed - as little as less than 1% for a Norwich Terrier, or as much as 46% for a Leonberger. So your first question should be, what is the actual likelihood of my dog developing a mammary tumor, based on her breed? See the infographic on the next page to determine where your breed falls on the "likelihood of mammary tumor" spectrum.

The treatment and prognosis for mammary tumors in dogs is very different than it is for humans. In most cases removal of the tumor (and usually the teat, as well) is the only treatment required and the dogs seem to tolerate the surgery very well - as of the time of this writing chemotherapy or radiation are not generally considered necessary.

I am in no way diminishing the seriousness of any kind of cancer (and this is not intended as veterinary advice). However, I'm afraid that the words "breast cancer" strike terror into our hearts in a way that may cause us to weigh the risk of mammary tumors in dogs too heavily, compared to other kinds of tumors and cancers that are more invasive to treat and carry a poorer prognosis than mammary tumors.



Spayed or not, make mammary examination part of your daily cuddle routine with your girls!

Likelihood of Developing Mammary Tumors by Ten Years Old

Note that this is for ALL tumors, both cancerous and non-cancerous.
According to the American College of Veterinary Surgeons, approximately only 50% of tumors are cancerous.

LESS LIKELY

0 - 10%

- Basenji
- Basset Artesian Normand
- Bearded Collie
- Belgian Shepherd Dog
- Border Collie
- Chihuahua (long-haired)
- Collie
- East Siberian Laika
- Finnish Hound
- Finnish Lapphund
- Finnish Spitz
- Golden Retriever
- Greyhound
- Groenendaeler
- Hamilton/Swedish Hound
- Havanese
- Icelandic Sheepdog
- Japanese Spitz
- Karelian Bear Dog
- Keeshond
- Kelpie
- Lancashire Heeler
- Newfoundland
- Norwegian Buhund
- Norwich Terrier
- Pomeranian
- Pug
- Schiller Hound
- Schipperke
- Shetland Sheepdog
- Shiba Inu
- Siberian Husky
- Swedish Vallhund
- Swiss Hound /Lucerne
- Tibetan Spaniel
- West Highland White Terrier
- Whippet

11 - 20%

- Alaskan Malamute
- Beagle
- Bernese Mountain Dog
- Bichon Frise
- Border Terrier
- Borzoi
- Briard
- Cairn Terrier
- Cavalier King Charles Spaniel
- Chihuahua (smooth-haired)
- Chinese Crested Dog Powder Puff
- Coton de Tulear
- Dachshund (long-haired)
- Dalmatian
- Danish/Swedish Farmdog
- Drever
- Elkhound
- English Pointer
- Flat Coated Retriever
- German Jagde Terrier
- German Longhaired Pointer
- Gordon Setter
- Irish Setter
- Jack Russell Terrier
- Labrador Retriever
- Large Poodle
- Lhasa Apso
- Maltese
- Miniature Pinscher
- Mixed Breed
- Munsterlander
- Norfolk Terrier
- Norrbotten Spitz
- Nova Scotia Duck Tolling Retriever
- Petit Basset Griffon Vendeen
- Samoyed
- Scottish Terrier
- Shih Tzu
- Smaland Hound
- Swedish Lapphund
- Tibetan Terrier
- Toy Poodle
- Welsh Springer Spaniel

SOMEWHAT LIKELY

21 - 30%

- Afghan Hound
- Airedale Terrier
- Basset Hound
- Bouvier des Flandres
- Bull Terrier
- English Cocker Spaniel
- English Setter
- German Shepherd Dog
- German Spaniel
- Great Dane
- Hovawart
- Irish Soft Coated Wheaten Terrier
- Old English Sheepdog
- Papillon
- Papillon Drop Ear
- Pyrenean Mountain Dog
- Rhodesian Ridgeback
- Rottweiler
- Saluki
- Staffordshire Bull Terrier
- Swedish Elkhound
- Yorkshire Terrier

31 - 40%

- American Cocker Spaniel
- Bedlington Terrier
- Boxer
- English Springer Spaniel
- Welsh Terrier

FAIRLY LIKELY

41 - 50%

- Doberman
- Irish Wolfhound
- Leonberger

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Keep in mind that these statistics are for ALL mammary tumors, and only 50% of mammary tumors are cancerous.

Furthermore, mammary tumors are rarely fatal, as The American College of Veterinary Surgeons explains:

> Mammary tumors are more *common in female dogs that are either not spayed or were spayed after 2 years of age.* The risk of a dog developing a mammary tumor is 0.5% if spayed before their first heat (approximately 6 months of age), 8% after their first heat, and 26% after their second heat...
>
> More than a quarter of unspayed female dogs will develop a mammary tumor during their lifetime. The risk is much lower for spayed female dogs, male dogs, and cats of either gender. In female dogs, 50% of mammary tumors are benign and 50% are malignant. However, *few of the malignant mammary tumors are fatal*... [emphasis in original]

Our experience and observation aligns with this - while mammary tumors in dogs are quite common, removal of the mass is usually curative and the dogs tolerate the surgery extremely well.

As with most cancers, early detection is key to good survival rates for mammary tumors in dogs. Studies have shown that one of the most important factors for survival in mammary cancer in dogs is **removal of the tumor sooner than six months after discovery.**

So, spayed or not, make mammary examination part of your daily cuddle routine with your girls. You'll get to know your bitches' teats by heart and any changes should jump out at you. Show all new lumps or changes to your veterinary surgeon for examination.

Although it's really still in the experimental stage, there is some research indicating that ultrasound could be used as a screening tool for mammary cancer in dogs. If you are fortunate enough to have a veterinarian who is skilled in ultrasound and you have the financial means to afford annual screenings, this is a great option.

Two's Company, One Is Done

Testicular Cancer

Testicular cancer is common in older intact males, but the prognosis is extremely good for full recovery with early detection and removal.

The exception to this is cancer in undescended testicles, which accounts for a disproportionately high number of testicular cancer tumors - only 1.2% of dogs will have an undescended testicle, but they account for 16% of all testicular tumors. Not only that, testicular tumors in dogs with undescended testicles occur earlier and tend to be more aggressive. Furthermore, undescended testicles are more prone to torsion. Surgical removal of the undescended testicle is always indicated.

Unfortunately, we have little to no data on the protective effect versus risk of leaving the descended testicle in place, as standard procedure is to do a complete castration rather than just one testicle. So the jury's still out on that, but it's worth thinking about.

Testicular cancer is almost never fatal with early detection. You need to examine your dog's testicles on a regular basis. I know a lot of pet owners feel weird about touching their dog's testicles, but if you wait for your dog's yearly wellness visit for your veterinarian to do it, it could be too late.

Begin when your dog is a puppy, checking to make sure that both testicles are descended. Continue to check testicles at least weekly throughout your dog's life. Gently palpate your dog's testicles. The tissue of both testicles should feel like a firm grape and the texture should be the same throughout the entire testicle. There is a harder part at one end of each testicle and that's normal. Other than that, however, there should be no lumps or bumps. Report any changes in texture or lumps to your veterinarian immediately.



Report any changes in texture or lumps to your veterinarian immediately.

No Harm No Foul

Benign Prostate Hyperplasia and Tumors

Intact male dogs have a higher risk of benign (non-cancerous) prostate hyperplasia (enlargement of the prostate) and benign tumors. These are non-life-threatening conditions which may cause discomfort in the dog. If necessary, neutering is generally an effective treatment for these conditions and the prognosis is extremely good - these are rarely, if ever, life-threatening conditions. And recent studies give hope that neutering might not be necessary to manage BPH - a simple therapy using only small electrical pulses has been shown to reduce the size of the prostate by 57%.

It's important to clarify again that, while intact male dogs are more likely to develop non-cancerous prostate conditions, neutered dogs are much more likely to develop cancerous prostate tumors, and there is a very poor prognosis associated with cancerous prostate tumors.

So, while we mention the risk of benign prostate hyperplasia and tumors in terms of full disclosure, there is no question that neutering carries a very high risk of life-threatening prostate cancer, whereas keeping a dog intact is protective against that cancer. In short, "preemptive" neutering is never a good thing when it comes to a dog's prostate.

Just as an aside, neutering is only a treatment for hormonally mediated prostate hyperplasia, and not all benign prostate hyperplasia is hormonally mediated. There can be a host of other reasons for prostate enlargement from infection to cysts - neutering won't help in these situations and it might hurt, so be sure you know WHY your dog has prostate hyperplasia before you run the knife!

Bad Hair Day

"Spay/Neuter" Coat

In some breeds (and mixes of those breeds,) spaying or neutering can completely change your dog's coat. The hormonal changes that come with spay/neuter can make the coat more woolly, fluffy, and dry.

Big deal, you might say. You're going to love your dog, even with a fluffy coat. Obsessing about a "correct" coat is another one of those fussy "show dog" things. But there's a reason dogs were bred to have the kinds of coats that they have, and those reasons are functional. Proper coats (depending on the breed) can be waterproof, shed dirt easily, or flow long without tangling or knotting.

Spay/neuter coats are much more likely to knot and mat, will not shed dirt, and can be very difficult to brush out. Spay/neuter coats always look ratty and unkempt and are difficult to keep clean.

While not a primary health issue, the difficulty of maintaining a spay/neuter coat means that owners are less likely to do what it takes to keep coats healthy, clean, and tangle-free, which can lead to secondary health problems.

Again, spay/neuter coat is more prevalent in some breeds than others, so consult your breed mentors to determine whether this is an issue for your dog.

Part Two:
Your Guide to the Behavioral Consequences of Spaying and Neutering

The Emotion of Hormones

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Male to Male Aggression.....22

Male Lovesickness.....22

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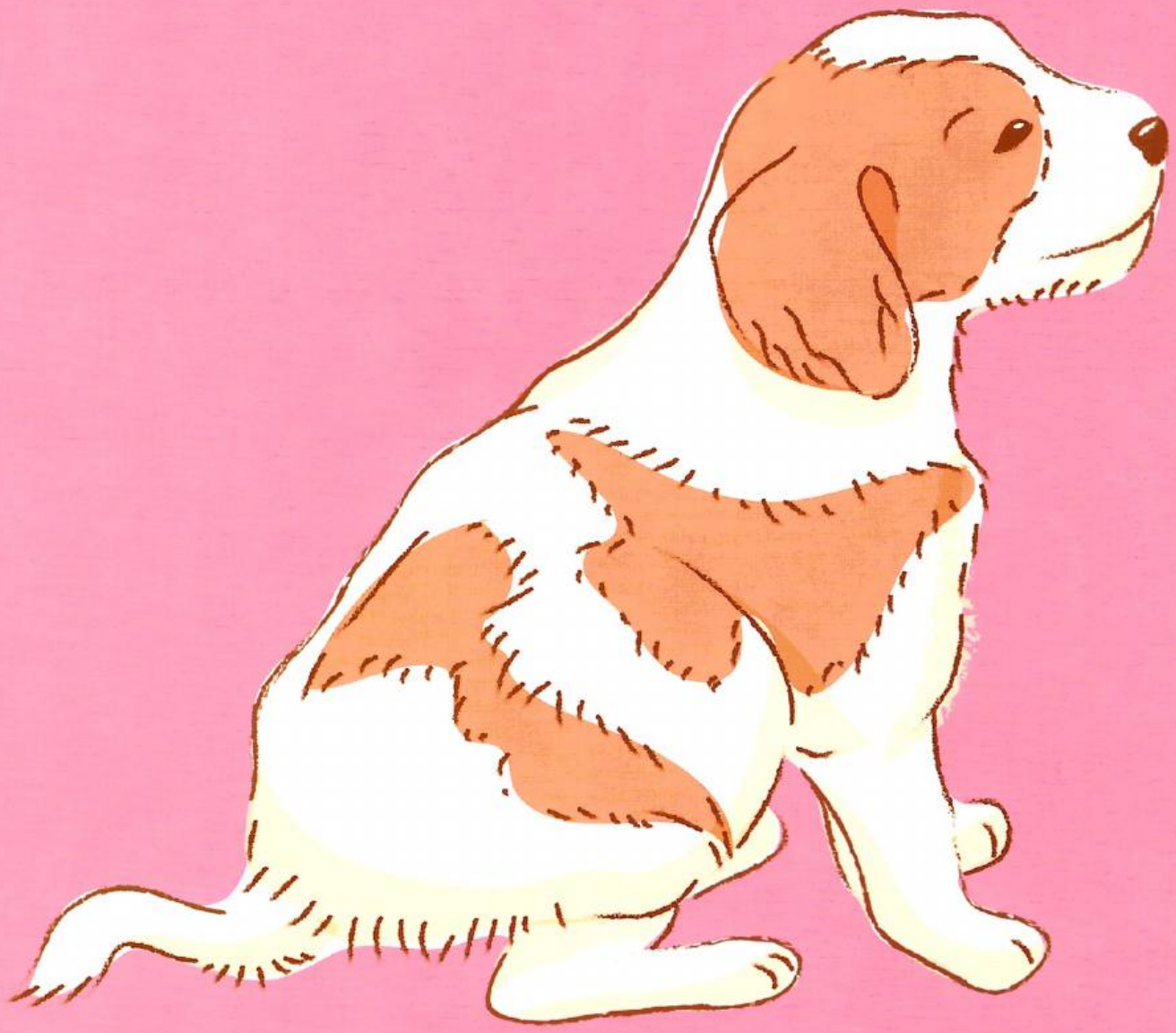

THE IMPACT OF SPAYING / NEUTERING on Your Dog's Behavior

Spay/Neuter DECREASES Risk of

- False pregnancy
- Bitches in season protective of their hindquarters
- Males being distracted by bitches in season
- Males fighting over bitches in season
- Male to male aggression ♥
- Leg lifting in the house ♥



Spay/Neuter INCREASES Risk of

- Owner-directed aggression in bitches ♥
- Stranger-directed aggression in bitches ♥
- Fear biting ♥
- Dog aggression in bitches ♥
- Inappropriate sexual behaviors
- Rapid dementia
- Noise phobias
- Timidity
- Excitability

Legend

♥ This behavior may result in a higher rate of relinquishment or euthanasia

The Emotion of Hormones

Behavioral Considerations of Spay/Neuter

With some very few (but important!) exceptions, spay/neuter is not the solution to your behavioral problems with your dogs.

It will only stop or lessen "sexually dimorphic" behaviors - meaning to say sexually driven behaviors that are typically different in bitches versus males. Suffice it to say, the majority of complaints dog owners have about their dogs are not "sexually dimorphic" behaviors. Spay/neuter won't stop human-directed aggression, won't stop most forms of dog aggression, won't calm your dog down, and won't make him or her trainable. And, believe it or not, it could make him or her worse:

- Spayed bitches have been found in some studies to have increased human and dog aggression. It's not clearly understood why this is but the thought is that the decrease in estrogen and oxytocin (also known as the "love hormone") after spaying leads to increased anxiety and aggression.
- Various studies (some of single breeds) have shown an increase in the following after spay/neuter:
  - **Timidity**
  - **Sound phobias**
  - **Aggression**
  - **Excitability**
  - **Fear biting**

In short, the hormones that we think of as "sex hormones" play an important role in maintaining mental stability and bonding in dogs, and we should think carefully about cutting them off UNLESS there is a very good behavioral reason to do so, which leads us to...

You May Live Forever, But I'm Going To Kill You

Spaying/Neutering Can Sometimes Improve Your Relationship With Your Dog

At the end of the day it's no good if a dog lives to 13 years old as an annoyance instead of 10 years old as a treasured member of the family. Meaning to say, long life only becomes the end-game after good pet quality is achieved, and it's no use making people feel guilty because they choose quality over quantity of life for their pets. Yes, your quality of life as a pet owner counts,

EXAMPLES OF SEXUALLY DIMORPHIC BEHAVIORS THAT SPAYING OR NEUTERING MAY IMPROVE	EXAMPLES OF NOT SEXUALLY DIMORPHIC BEHAVIORS THAT SPAYING OR NEUTERING WILL NOT IMPROVE AND MAY MAKE WORSE
Leg lifting in the house.	Pooping in the house, peeing in the crate, or general house training issues.
Males fighting over bitches in season.	General and ongoing dog aggression either with housemates or outside dogs.
Bitches being sensitive about their hindquarters when in season.	For bitches not in season, snapping or aggression during body handling or any kind of reluctance to be touched.
Males being distracted in the presence of females in season.	General lack of attention, obedience, or trainability.
Males mounting females.	Obsessive or inappropriate humping of objects, people, or other dogs.
	Any kind of human-directed aggression or resource guarding.

so don't let anyone make you feel bad for considering your own feelings in the matter.

While spay/neuter will not help most behavior problems and might make them worse, there are a very select few behavior problems that can be solved by altering the animal. And, in our opinion, if one of these behavior problems is interfering with your ability to enjoy your pet, you are justified in considering spay/neuter as a solution, even if spay/neuter carries some health risks.

Don't Piss Me Off!

Male Leg Lifting Indoors

Neutering will often stop male leg lifting in the house. For a lot of people, a dog lifting his leg in the house is a deal-breaker, and I can't say I blame them.

There are definitely non-surgical alternatives, such as belly bands, which will contain the mess, but you still have to deal with the dirty belly band, which might not be everyone's cup of tea.

The good news is there's no reason to do a preemptive strike and neuter your dog at a young age because studies have shown that the timing of the neutering has no effect on how well the neutering works to stop the behavior. This indicates that this is a hormonally controlled behavior rather than a "habit" so you can safely take a "wait and see" attitude toward marking in the house.

In our work as dog trainers and rescue foster homes, we have noted that it is not uncommon for dogs who were neutered very young to lift their legs in the house. So the neutering is only going to help if the leg lifting is driven by sex hormones, and that is not always the case. For all we know the interruption of normal sexual development by early neutering may contribute to inappropriate leg lifting, but we are unaware of any study that examines this.



Belly bands are a simple rectangle of absorbent fabric, secured with Velcro, that will contain the mess if your male lifts his leg indoors.

Moreover, if your dog has a show or reproductive career, you can use a non-surgical alternative like a belly band until it's a good time to neuter him – there is no need to rush for the knife!

You Lookin' At Me?

Male to Male Aggression

In our observation and experience, if you have a male dog that generally likes other dogs but has a problem with other intact males, neutering can help make him less reactive toward other intact males. But it bears repeating that general aggression towards other dogs will not be reduced by neutering - if your male dog does not like other dogs in general, neutering will not help.

Note that spaying will not reduce bitch to bitch aggression and may make it worse, possibly due to the reduced oxytocin (aka, the "Love Hormone") and estrogen levels post-spay.

Cure for Lovesickness

Males Who Lose Their Minds Around Bitches In Season

If you do keep intact males and females, some males suffer quite badly when there are bitches in season in the house. If you have one dog and one bitch, chances are everyone can ride it out every 6-12 months. Another option is to simply send either the dog or bitch away until the season

is over. But if you're running several bitches and have a non-breeding male in the house getting lovesick frequently, this can be a real issue that neutering will solve.

Also, some males engage in almost obsessive mounting and humping of females even if the females are not in season. In the absence of a female, this can occasionally manifest into endless humping of inanimate objects. More often this is a young dog thing and will pass with maturity, but some dogs never get over it and are just obsessed by sexual behavior. Neutering will usually solve this.

This is ONLY true of males humping females in a sexually driven fashion. There are dogs (and bitches) who engage in compulsive humping behavior of people and dogs, regardless of sex. This is a different issue and will not be solved or helped by neutering. And, in our experience and observation, spayed bitches tend to hump more so spaying will not stop this behavior in females.

Pay Attention!

Trainability and Spay/Neuter

Multiple studies have found that neutering does NOT increase "trainability." On the contrary, in some studies intact animals were found to be more "trainable" than neutered animals. For the average pet owner, neutering is a bad choice vis-a-vis "trainability."

However, I will tell you from personal experience and the experience of friends that there are some male dogs that are so sexually driven that it is just about impossible to compete in performance venues with them. So if you're planning on doing agility, obedience, or any other dog sport that requires dogs and bitches to mingle together, SOME male dogs focus much better after neutering.

Once again, the length of time the dog was intact and even having experience breeding bitches does not seem to influence how effective neutering is in stopping this kind of sexually driven behavior, so there's no reason to rush to an early neuter. You have everything to gain by allowing your dog to grow at least until his growth plates have closed before even considering neutering him. You should not be training hard or competing before this time anyway (see our "Puppy Fitness That Fits the Puppy" booklet for age-appropriate exercise guidelines) so there's no advantage to an early neuter.

ALL young dogs are distracted and sensitive to their environment when first beginning to compete, and neutering is no substitute for training. The kind of behavior that neutering will help with is purely sexually driven, and it accounts for a tiny fraction of performance issues. It's not the garden variety "nervous" or "distracted" - it's full-on whining, panting, leg lifting, sniffing, and teeth chattering. If you've ever lived through having an intact male and a bitch in season in the same house, you know what it is, and neutering will definitely help.

Missing The Party

Lifestyle Issues With Intact Animals

Trainability aside, if you have a bitch she will not be allowed to compete in AKC agility or obedience/rally when she is in season, so that will cut into your trialing calendar. Also, she probably won't be welcome at the dog park or at daycare when she's in season. Some daycares won't accept intact animals at all, male or female. So you will have some inconvenience in those areas with an intact animal.

Don't Mess With Me

Behavioral Changes In Bitches During Seasons

Many bitches can become extra cuddly or even "clingy" when they come into season, but some bitches can become very sensitive to being touched around their hindquarters when they come into season. Some bitches will generalize this sensitivity to the point where you can't even touch their sides when they are in season without them objecting. This will pass when their season ends (and often gets better with subsequent seasons) and all you have to do is respect your bitch during this time, but not everyone is willing to manage this. Spaying will stop these behaviors.

Also, some bitches experience extreme false pregnancies, complete with lactation as well as adoption and guarding of inanimate "puppies" - stuffed animals, toys, even shoes. These bitches will carry objects in their mouths and whine, and may take objects into their crates and guard them like a litter.



You can stop this within a few days by doing the following:

1. Do **not** allow her access to anything she can carry in her mouth - no "puppy substitutes."
2. Do **not** allow her access to a crate or any kind of den-like area (if possible).
3. Fast her for **one day.**
4. Feed her **half or even quarter rations** for the next 2-4 days until the behavior stops and her milk dries up.

False pregnancies can easily be managed this way and are not usually a big deal. However, if the false pregnancies are extreme or if your bitch becomes aggressively protective of her "babies" or her "den" during that time, spaying will definitely prevent this.

And Clean Up This Mess

Finally, we have to put it out there that having a bitch in season is messy and involves pants or cleaning up some messes. Most bitches keep themselves pretty clean and your job in this regard will be minimal, but it's still something to consider.

Please Fence Me In

It's true, neutering will reduce roaming, but I'm writing for the "organic-cotton-consulting-animal-communicator-over-privacy-fence-color" crowd. Your dog is more likely to be wearing pajamas than roaming the neighborhood. So this is a non-issue for people like you.

Yes, having an intact bitch will cramp your style slightly - you can't go to the dog park or even take leash walks if there are loose males around. While I understand that some things like marking in the house are real and ongoing lifestyle problems, having to keep your bitch home for a few weeks each year seems to me not a big price to pay for the health and behavioral benefits of spaying later in life or not spaying at all.

A much-touted study found that spayed/neutered animals lived longer than intact animals. However, the study failed to take into consideration people like you who do not allow their pets to wander. The study indicated that one of the primary reasons unaltered animals died was trauma - getting hit by a car, animal fights, etc. If you back out the dogs who were allowed to wander free and get injured, the picture is very different. The spayed/neutered animals had many times the occurrence of cancer and disease and had significantly shortened life spans. Again, a perfect example of how advice for one demographic may not be the best advice for another demographic!

Part Three: Making Decisions About Spaying and Neutering

Weighing the Evidence

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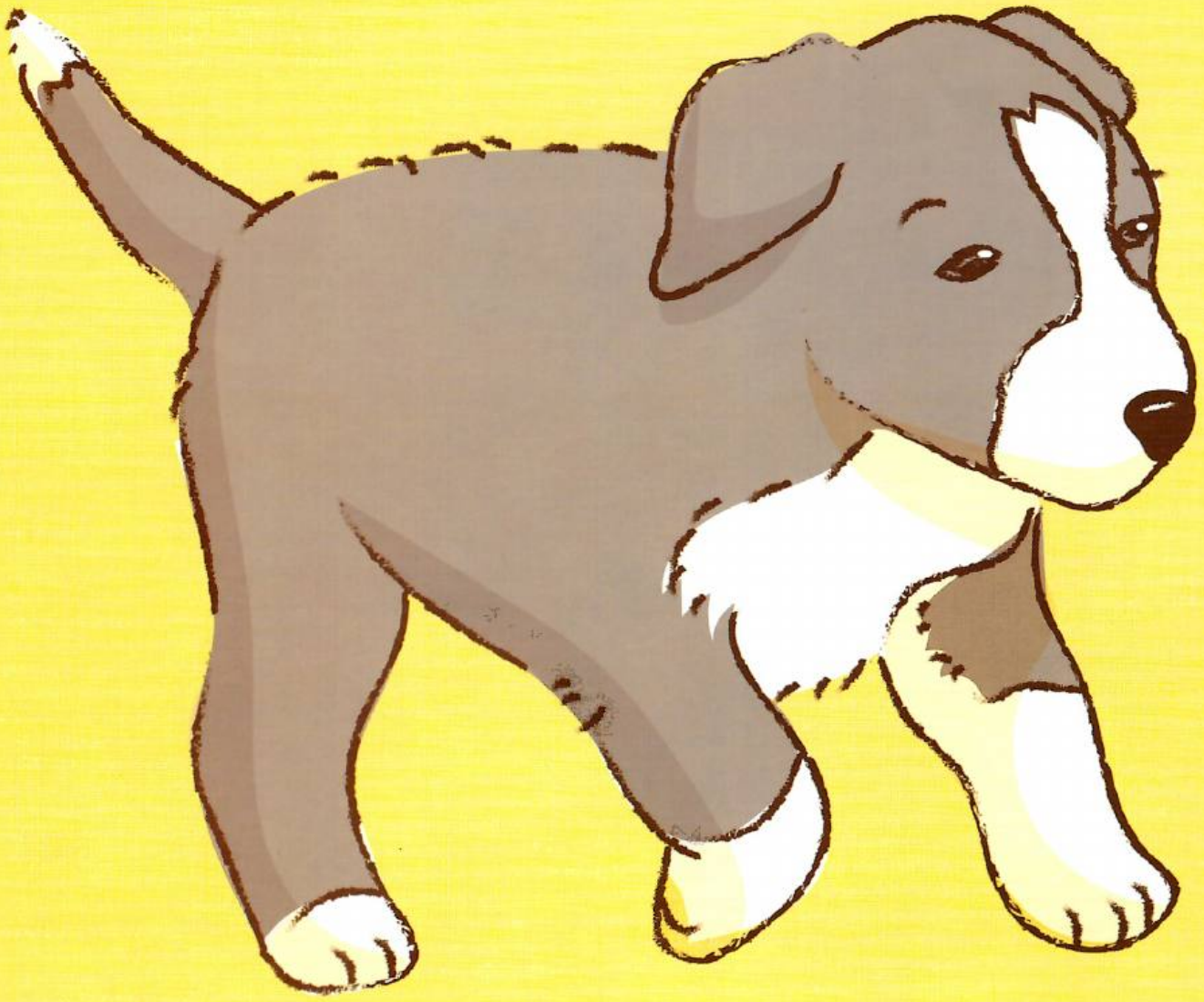


So, What Should I Do?

Now we come to the heart of the matter - practically speaking, what does all this mean to you as a pet owner? This is where you're going to have to weigh the evidence for yourself based on you and your dog's circumstances, but here is what we recommend, based on the evidence and our experience.

Males

We strongly recommend that you keep your male dog intact for his entire life unless there is a compelling health or behavioral reason to neuter him. We believe this so strongly that we have our puppy buyers sign a contract to this effect.

If for any reason you are dead set on neutering your dog, we advise that you wait until your dog is at least 18 months old or growth plate closure has occurred (whichever is later). If you want to be really safe you can confirm growth plate closure by x-ray. You can manage any behavioral issue for 18 months and it's a reasonable "cost" in exchange for the health benefits. And if you can swing it we suggest you keep your dog intact until stable emotional maturity, usually somewhere around 3-4 years old.

One exception to this would be an undescended testicle, which needs to be removed as soon as possible, but you still might consider leaving the "good" testicle.

Testicular cancer is virtually unknown in young dogs but that would be another exception if by some slim chance it happened.

Bitches

It's more complicated with the bitches, because you have to factor in your risk of pyometra and mammary tumors, which will be very breed-dependent (see infographics on pages 13 and 16). Pyometra can be avoided with an ovarian-sparing spay (see page 28), but that still leaves the risk of mammary tumors.

For us, any benefit of spay before growth plate closure (usually around 18 months old) is far, far, outweighed by the health and behavioral downsides. So, even if you're in a relatively high-risk breed for mammary tumors, we would not recommend a full spay (as opposed to an ovarian-sparing spay - see page 28) before 18 months old at the very youngest. If you want to be really safe you can confirm growth plate closure by x-ray. Beyond that, it's tricky and you have to weigh breed- and line-specific risks against the risk of mammary tumors.

We have been unable to find one permanent behavioral upside to early spay and there are lots of potential behavioral downsides, so we see no argument from a behavioral standpoint for early spay.

So, unless a bitch actually has pyometra (not puppy vaginitis) we believe there is never any reason to spay her before at least her second season or 18 months old, whichever is later.

Because our breed (Bull Terriers) does have a significant risk of pyometra as they age, we recommend that bitches be spayed no later than 6 to 7 years old. Ideally, we like to allow bitches to reach stable emotional maturity before they are spayed which, for us, is about 3-4 years old. So we like our bitches to have their uteruses out no earlier than 3 years old and no later than 6 or 7 years old. But, as noted, this will vary A LOT from breed to breed.

Timing Is Everything

Early Spay/Neuter

If, for whatever reason, you have decided to spay or neuter, consider carefully at what age you have the procedure performed. The negative health effects are often magnified on a sliding scale the younger the dog is at the time he or she is altered. Eighteen months is a line in the sand for us as far as when to spay or neuter. We never do it earlier than 18 months if there is any way we can avoid it.

What's so special about 18 months? Two things: growth plates normally finish closing around this age, and there is an emotional transition out of puppyhood and into young adulthood.

EFFECT OF AGE
at Time of Spay/Neuter

Early spay/neuter (between 5.5 and 18 months old) has been shown to further increase the risk of all listed disorders above the baseline.

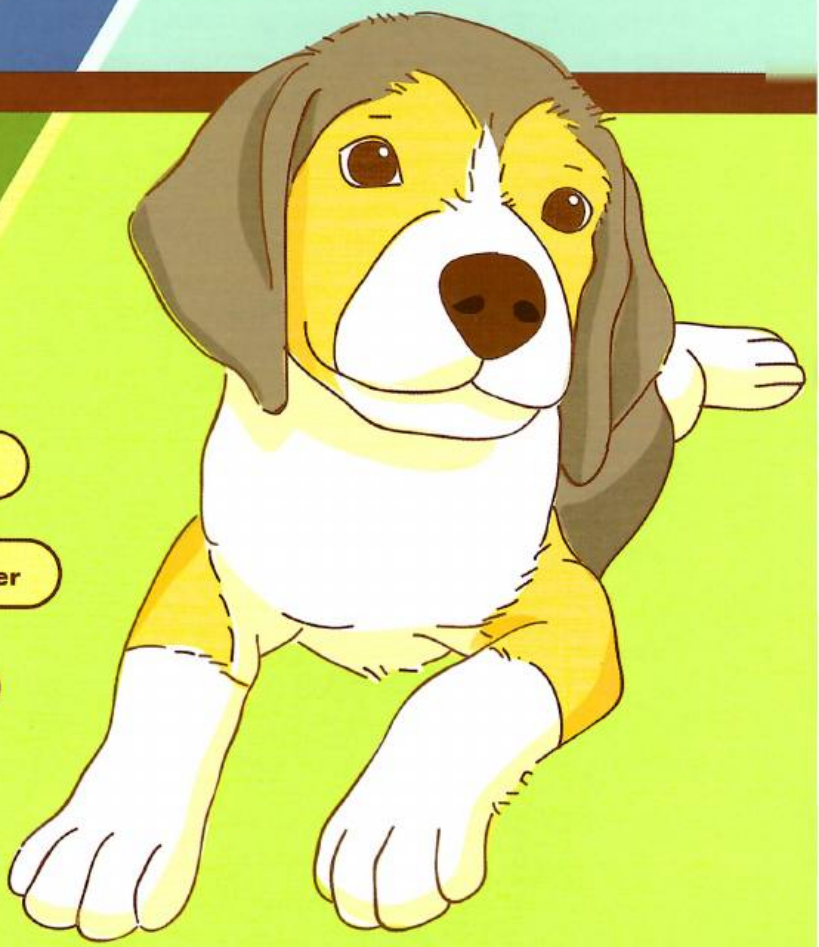
Early Spay/Neuter COMPOUNDS Risk of

- Bone cancer
- Hip dysplasia
- Cruciate ligament tear
- Hormonally mediated bladder infection
- "Spay" incontinence
- Immature vulva chronic bladder infection

BASELINE LIFETIME RISK FOR ALL DOGS

Early Spay/Neuter REDUCES Risk of

- Pyometra
- Testicular cancer
- Mammary cancer



Note that age at which a puppy's growth plates close can vary GREATLY from breed to breed - growth plate closure in giant breeds can be significantly later than in small breeds. The latest *average* growth plate closure for any breed is 18 months, but there are always individual exceptions. Confirm growth plate closure by x-ray if you want to be certain!

Therefore, 18 months represents the very minimum chance we feel you should give any dog to mature physically and emotionally before interrupting their hormonal balance.

Beyond that, it becomes a judgment call. In some cases, the longer you can put off spay/neuter, the lower the risks will be. In one excellent study of Rottweilers, they were actually able to determine that for each month the animal remained intact, the likelihood of the dog developing bone cancer was reduced by 1.4%. But you have to balance that benefit against things like mammary cancer and pyometra.

We have found that allowing animals to remain intact until stable emotional maturity is reached (around 3-4 years old) is positive from a behavioral point of view. For *most* dogs, reproductive cancers and disorders are rare at this age, so the risk of waiting to spay/neuter is minimal. Obviously, if there is cancer or disease in a reproductive organ, it needs to come out. But from a *general* health and behavioral perspective, it seems that the longer you can delay, the better.

For the purposes of this discussion, stable emotional maturity is the point at which the dog's personality is more or less "set" and less likely to be permanently impacted by physical or emotional trauma. It can happen as young as two years old or as late as four years old, depending on the breed or even lines within the breed.

Your breed mentors will be your best source for information for when you can expect stable emotional maturity in your dog.

If you have a mixed breed dog, 3-4 years old is a safe bet.

Having Your Cake And Eating It, Too

Ovarian-Sparing Spay

If you are coming down on the side of spaying, we certainly think ovarian-sparing spay is a less catastrophic route and we advocate for it. In an ovarian sparing spay, only the uterus is removed and the ovaries remain. Sex hormones are still present to regulate important functions. Your bitch will cycle through her seasons, but there will be no bleeding so no need for "season pants" and no mess to clean up.

Leaving the ovaries in and taking just the uterus out presumably confers all the protection against cancer and endocrine disorders that intact bitches enjoy, without the risk of pyometra or uterine cancer, so that's a huge win.

However, you'll still have to consider mammary tumors if you don't remove ovaries. To our knowledge the effect of ovarian-sparing spay on mammary tumors has not been studied so we take a safe road and assume the risk is the same as in intact bitches.

And, if your complaint with your bitch is behavioral, ovarian-sparing spay will not help. Your bitch will still cycle through seasons, although she won't have any bleeding, so if she has a problem with being touched on her hindquarters or false pregnancy, ovarian sparing spay will not make a difference.

Also, you should be aware that your bitch may still be willing to allow a male to breed her after an ovarian-sparing spay. This should not be more than an inconvenience in most cases. But if the male is much larger than the bitch, there is reportedly a danger of vaginal rupture. We could not find any research on this other than anecdotal material on various forums, so the jury's out on how serious a risk this is.

While the ovarian-sparing spay may not carry the health risks of a full spay, it's still a lot to put a young body and mind through, and there's really no reason for a conscientious pet owner like you to do it before your puppy is 18 months old, other than avoiding the small inconvenience of a couple of seasons.

If it's for some reason necessary to do a juvenile spay, yes, an ovarian-sparing spay is a less catastrophic option. But consider waiting if there is any way you can.

We recommend staying on the safe side and keeping your bitch away from any intact males when she appears receptive to their advances. This could be especially relevant if your bitch goes places such as doggy daycare where the situation is not within your control and she could be exposed to intact males much larger than she is.

So, if you do routinely put your bitch into situations where you do not have control over what animals she encounters (daycare, off-leash parks, etc.) you might consider a full spay.

Just a final note on ovarian-sparing spay - it's a relatively new procedure in the United States and not many veterinarians are currently performing it. It requires a more skilled surgeon and you do have to seek out someone who is trained in the procedure.

In a full spay, the surgeon does not need to take care to remove the entire uterus - once the ovaries are out, the threat of pyometra is gone so it does not matter if a little of the uterus is left behind. But in an ovarian-sparing spay, ALL of the uterus has to come out because the ovaries are still producing hormones and there is a danger of "stump pyometra" if any of the uterus is left. It's not a terribly complicated procedure but the veterinarian has to understand how and why to do it. **You can find a provider near you who performs the procedure at www.parsemus.org.**

What's Good For The Goose Is Not Good For the Gander

Vasectomies

Yes, vasectomies are available for male dogs, but they will make zero difference in the health or behavior of your male dog. The only benefit of a vasectomy is that your dog will be unable to get a bitch pregnant, which we know is not an issue for you because you don't let your dog roam. Vasectomies will have no effect on the behavior of your dog.

We've Got Your Back

Advocating For Your Dog

But this still leaves you in a difficult position - what do you do when you're looking at your vet over the examining table and she tells you to spay or neuter your puppy or young dog ASAP? Even very experienced breeders can be intimidated when confronted by a person of authority, and, indeed, those people of authority can get very touchy when questioned on a point such as this.

First of all, your vet really does care about your dog - it's not like veterinary professionals are in some kind of conspiracy to harm animals. The problem is that we're just now realizing the long-term effects of spay/neuter and the information has not filtered into "standard veterinary practice" yet. That's one of the reasons we've put together this book and included citations to the original studies.

If your vet or anyone else pressures you to spay/neuter your young dog, you can share this book with them so he or she can read for themselves what the current studies indicate. They may or may not accept your decision, but at least you will have made your point of view clear without being confrontational.

Lots of Hugs but No Regrets

Options for Animals That Are Already Spayed or Neutered

But what if you have a dog at home that you've already spayed or neutered at a young age and now you feel terrible about it? First of all, don't

feel bad about your decision - you did what you thought was right at the time. It's part of life that our best decisions at one point are not our best decisions at another point. So lots of hugs and no regrets.

Here are a couple of suggestions for you. Although we could find no scientific studies regarding hormone replacement therapy in dogs, there are a number of holistic veterinarians who advocate the practice and offer HRT consultations for dogs. Hormones are used in spayed and neutered animals to treat specific disorders which arise from lack of sex hormones, so it stands to reason that hormone supplementation might also be a preventative measure, although, as mentioned, we know of no study on that subject.

Another thing you can do is to keep your pet lean and active - I know, difficult when they are actually hungry, but keeping them fit has huge health benefits including staving off orthopedic problems and diabetes.

You Can't Do Better Than Your Best

Coming to Terms With Your Decisions

Decisions are always difficult, especially when your dog's health and well-being are at stake. And yes, there are no guaranteed "right" answers when it comes to whether or when to spay/neuter. But, if you've taken the time to read this booklet, you've educated yourself on the implications of spay/neuter and done the best you can. Your decision will be an informed one and we feel confident it will be the right decision for you.



A Postscript On The Evidence

How We Decided What To Include In This Booklet



On the following pages you will find a list of selected references. We purchased and read all the original studies but in the interest of space we did not cite a study if it was already included within another study or survey of studies.

One thing we learned when researching this book is that scientists disagree about findings and conclusions just as much as the rest of us do. We waded through the exhausting rabbit warren of back and forth arguments between scientists about the health and behavioral effects of spay and neuter - if you want to dig into the bibliography and read the original studies, go for it! But before you jump in, there are two things you need to know as a pet owner:

1. **Correlation is not causation:** Just because there are more cases of a certain disorder in neutered dogs does not mean that neutering is responsible for that disorder. There is a host of factors - from age to diet - that could be the cause.

   We did weed out studies that did not control for age where age was an obvious risk factor for that particular disorder.

But before you discount the potential link between altering and a disorder, see our second point, which is:

2. **"It has not been proven" does NOT equal "it is not true:"** Meaning to say, even if there are no studies proving that altering causes a certain disorder, that doesn't mean it's not possible. It just means no one has had the financial motivation to sponsor a study to prove or disprove it.

In general, dogs are not a "big money" animal and the only time you're going to get a really good study is when a scientist is using dogs as a human model. So sometimes, particularly if there are good human studies that support the hypothesis, you should not ignore something because there are no dog studies that prove it or

a study "only" showed a correlation and did not conclusively demonstrate causation.

So, all caveats aside, even if some studies could be criticized as imperfect, we looked at the preponderance of data and found the following:

- That in all cases there is a strong correlation and in many cases proven causation between spay/neuter and negative health and behavioral consequences.
- Aside from the possible decreased risk of mammary cancer, there does not seem to be any appreciable health benefit to spay/neuter.

Finally, I would like to point out that many of the diseases and disorders we've talked about are either not life threatening or extremely rare, but they are still significant. Maybe you don't have to stay awake at night worrying about, for instance, pemphigus complex, but that's not the point. For us, the overall takeaway and the reason I included all of these "little" disorders is that spay/neuter appears to punch a lot of pin holes in your dog's health which we feel can weaken the overall fabric of their well being. And what we know is probably just the tip of the iceberg.

We could not find a study on behavior or orthopedic injuries that controlled for whether a dog was a breed champion or a successful performance/working dog. We think this is a dimension that should be explored to rule out the possibility that the reduced number of behavioral and orthopedic issues in intact animals is actually (in whole or in part) a byproduct of breeder selection.

Show and working dog breeders, as a whole, are people of huge wisdom and experience and they presumably know what they're doing when they place an animal as a pet or keep it to breed. It would not be surprising to find that the intact animals kept by show and working breeders experience fewer orthopedic problems and have the best possible temperaments - they are (at least from the breeder's point of view) the "best of the best" that have been retained in the breeder's program and not placed as a pet and neutered.

Despite this lack of control for "quality" of the dogs in the study, we included evidence on orthopedic and temperament issues because we felt the sheer volume of evidence warranted it, although we do feel that the orthopedic issues have been more compellingly demonstrated than the behavioral issues.