

Canine Reproduction

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Dr. Margaret Root-Kustritz said that gonadectomy, the standard practice for sterilization of dogs and cats in the United States, has traditionally been done around the age of six months. Though the procedure is commonly performed, there is uncertainty about whether elective sterilization is beneficial, and if so, whether six months is the optimal age to spay or neuter a dog.

A wide range of benefits and detriments are associated with sterilization. "I'm not going to tell you this is the age you should spay or neuter," Dr. Root-Kustritz said. The decision should be based on the breed, the working purpose of the dog, and the desires of the owner.

The prevention of pet overpopulation, a serious and continuing problem in the United States, is one societal benefit of sterilization. Millions of dogs and cats are euthanized in this country each year. Spaying and neutering at an early age increases the chances that people who adopt animals will not relinquish them, Dr. Root-Kustritz said. Only 60% of people who adopt from a shelter comply with the requirement to have the animal spayed or neutered.

In surveys of people whose intact animals gave birth, 56% of canine litters and 68% of feline litters were unplanned. This is likely the result of ignorance of, or misinformation about, the animal's normal reproductive physiology, Dr. Root-Kustritz said.

She advised that dogs with no guardian should be spayed or neutered. If the owner is a responsible person who will not let the dog breed indiscriminately, however, she said she sees her role as a veterinarian to be one of education only.

Castration in male dogs decreases the incidence of testicular neoplasia, a tumor common among older animals. However, only 0.9% of dogs fall prey to this disease, which is easy to diagnose and cure. Castration also decreases the incidence of benign prostatic hypertrophy, which is seen in 75%–80% of dogs older than six years. Even here, morbidity is low, and castration is curative. A positive correlation has been noted between castration and increased lifespan; this may be because owners who pay for castration are typically more likely to take good care of their dogs and not allow them to engage in high-risk activity.

Despite these health advantages, sterilization can lead to problems. Multiple studies have shown a rise in the incidence of obesity in both male and female sterilized dogs. While obesity is the most common nutritional disorder in dogs, it can be controlled with proper diet.

Castrated dogs are two to four times more likely to develop prostatic adenocarcinoma, a high morbidity and high mortality glandular tumor. Only 0.2%–0.6% of dogs will develop this disease in their lifetime. Although most owners choose to euthanize a dog with this diagnosis, Dr. Root-Kustritz cautioned against generalizing from these statistics. Prostatic adenocarcinoma is not hormone-dependent; therefore, there is no cause-and-effect relationship.

Osteosarcoma, or bone cancer, is a very aggressive tumor characterized by high morbidity and mortality. Castrated males are one to three times more likely to develop this disease, which occurs in 0.2% of the population—usually in older dogs. Large and giant breeds are most at risk, Dr. Root-Kustritz said. A study of Rottweilers showed a predisposition to the disease, so genetics may be as much of a causative factor as castration.

Also more common in large breeds is hemangiosarcoma, a tumor found in any organ with a large blood supply. The risk to castrated dogs is twice that of intact animals. Although it occurs in only 0.2% of all dogs, Dr. Root-Kustritz said surgery to remove the tumor is risky and mortality is high.

A higher risk of anterior cruciate ligament (ACL) injury, the most common orthopedic ailment in athletic dogs, was linked in one study to sterilization. Anecdotal evidence involving a relationship between a higher incidence of ACL injury and lower estrogen levels in women suggests that hormones play a role in the development of this disorder. Large breeds are more at risk, Dr. Root-Kustritz said. Billions are spent each year in this country on surgery to cure this ailment.

Benefits of sterilization in female dogs include a decrease in the incidence of mammary neoplasia, which occurs in 3.4% of all animals and is malignant in more than half these cases. Although the causation is not as clear as in humans, studies appear to show a hormonal basis for the disease.

“It has been demonstrated in numerous studies that you greatly decrease the incidence of mammary neoplasia in dogs by spaying them, and that you get the greatest benefit if they never go through heat at all,” Dr. Root-Kustritz said.

Pyometra, or uterine disease, is normally seen in older dogs that have experienced numerous heat cycles, when hormone levels are extremely high. Swedish studies show the incidence of this disorder is 15.2% by four years of age and 23%–24% by 10 years of age. Ovariohysterectomy (OHE) is curative; however, surgery is dangerous and post-OHE mortality is as high as 17%.

Problems associated with sterilization in females are the same as in males, including greater risk of obesity and development of some types of tumors, including osteosarcoma.

Spayed females also are at higher risk for transitional cell carcinoma, a tumor of the urinary tract. Although the incidence is only 1.0%, Dr. Root-Kustritz said mortality is

high. Environmental factors contribute to the development of this tumor and should be considered before making the decision to spay.

Urinary incontinence (UI) presents in 5%–20% of spayed females. Dogs with this disease tend to leak urine while they sleep. In addition to spaying, Dr. Root-Kustritz said risk factors include breed, and weight greater than 20 kilograms. Studies published in the *Journal of the American Veterinary Medical Association (JAVMA)* in 2002 and 2004 show a greater risk of UI in dogs spayed before three months of age.

Disorders in male dogs that benefit from castration generally have low morbidity and mortality rates, whereas the severity of negative consequences associated with the procedure appears high. While there are many reasons to sterilize a male dog, Dr. Root-Kustritz said the detriments appear to outweigh the benefits. She recommended assessing the need for castration on a case-by-case basis.

Similarly, while there are many benefits and detriments to spaying, the diseases that appear to be exacerbated by sterilization are fairly uncommon or have low mortality rates. Conversely, diseases that benefit from spaying are more common and have much higher morbidity and mortality rates.

Dr. Root-Kustritz said she recommends spaying after the age of three months to lessen the incidence of UI, but before the dog goes through its first heat. For most dogs, this means sterilization at about six months old.

An article she wrote on this subject, in which Dr. Root-Kustritz included information on risk factors by breed, will be published in the December 2007 issue of *JAVMA*.

Discussion

A participant asked whether there is research to back up the claim that spayed and castrated dogs show a higher incidence of aggression or fearfulness. Dr. Root-Kustritz cited a study done with the English Springer Spaniel that proved this statistically. However, she said, while spayed or castrated dogs might be predisposed toward aggression, this behavior can have multiple causes, and even intact dogs can become aggressive.

Another participant asked about the relationship between sterilization and premature epiphyseal closure. Dr. Root-Kustritz said studies with cats have shown spaying or neutering before the growth plates close can result in a slightly taller-than-average animal. Estrogen and testosterone are necessary for the growth plates to expand quickly during puberty, and then close. If sterilized before they go through that growth phase, the animal is never exposed to those hormones. She said there is no evidence that sterilized dogs are more susceptible to fracture.