The Great Spay/Neuter Debate – Who, when, and what?

One of the greatest questions in veterinary medicine today surrounds the optimum age for spay/neuter. There are many factors to consider and **there is no one correct answer for all animals**. The primary considerations are: Is this animal owned or un-owned? What is the animal’s purpose or work? Is the breed predisposed to certain diseases? What is the owner’s comfort level with health risks and management of an intact animal?

**NB: In keeping with the current terminology in literature, neuter is used here to refer to gonadectomy regardless of the animal’s gender.**

Owned vs un-owned animals

Animals that are purposefully-obtained and retained in a stable home are more likely to receive routine veterinary care and be prevented from producing unintentional or unwanted litters. Animals that are un-owned, e.g. feral, stray, or in shelters, are best managed as a population rather than individuals to reduce further population growth and the incidence of infectious disease. Gonadectomy of un-owned animals in shelters may increase adoption rates, and removes issues of compliance with sterilization contracts after adoption.

Male and female cats

There is no change in urethral diameter or in risk of urinary tract disease regardless of age of neuter in male cats. Neutered cats are shown to have longer lifespans than intact cats. Males that go through puberty and start spraying may continue this as learned behavior even after neutering. Female cats may have spontaneous ovulation that can lead to pyometra, even without access to a tom.

Reproductive disorders

The reproductive disorders of concern in male dogs are testicular neoplasia, benign prostatic hypertrophy/hyperplasia (BPH), and prostatic neoplasia. With rare exceptions, testicular neoplasia and BPH can be cured with castration at any age, provided the dog is healthy enough to undergo anesthesia. BPH can also be managed medically with few negative side effects. Prostatic neoplasia occurs uncommonly in both neutered and intact males, with higher incidence in neutered dogs. The prognosis is generally poor and median survival times are low. Neutering reduces or eliminates the risk of perianal adenomas. Penis size remains immature in dogs neutered prior to puberty, however the health significance of this finding is unknown. Stereotypical male behaviors, e.g. marking, humping, etc, are learned behavior and will likely not be affected by neutering after these behaviors have developed. Anecdotally, males neutered after maturity typically show reduced but not absent interest in estrus bitches.

Intact bitches are at risk for pyometra with each heat cycle. Pyometra may be treated medically or surgically, with varying outcomes, and is potentially fatal depending on severity of disease. The incidence of mammary cancer is also increased in intact bitches, and in bitches that have been through one or more heat cycles. Multiple studies have shown incidence rates of 1% to 3% depending on age and breed. Ovarian and uterine neoplasms are uncommon in bitches and can usually be treated surgically; the incidence of malignancy is unclear.

Nonreproductive disorders

Studies on the long-term effects of spay/neuter status in dogs are retrospective, with the notable exception of the Golden Retriever Lifetime Study currently in progress. Most have also focused on an individual breed. This limits the ability to generalize data or determine causality.

The publication (Waters 2009) that seemingly started the debate of optimum spay/neuter age, at least in the public media, was a retrospective look at a population of exceptionally long-lived rottweilers. Female dogs in that group outlived males, and the presence of ovaries was associated with longevity, regardless
of cause of death. Females that were neutered at less than 4 years of age did not have greater longevity than males. The steroid hormones affect growth plate closure in the long bones. Neutering prior to growth plate closure may result in more long bone growth. This is believed to affect the angles between joints and the ligament support of those joints. A retrospective study of golden retrievers (de la Riva et al 2013) showed increased risk of cranial cruciate ligament rupture in neutered males and females as compared to intact animals, and increased risk of hip dysplasia in neutered males but no change in females regardless of neuter status. The same study showed no change in risk for hemangiosarcoma or cutaneous mast cell tumor in neutered males, but increase in risk for neutered females. Males, however, had increased risk of lymphoma if neutered, and no change was noted in females. A study from the same group (Hart et al 2014) compared these results to neutered and intact Labrador retrievers. They showed increased risk of cranial cruciate ligament rupture in male Labradors neutered prior to 6 months of age, and increased risk of hip dysplasia in females neutered prior to 12 months of age. There was no significant difference for hip dysplasia in males, cranial cruciate ligament rupture in females, or in cancer risk for either gender. They concluded that “breeds respond very differently to the effects of neutering on joint disorders and certain devastating cancers.”

Results from a voluntary online survey of vizsla owners (Zink et al 2014) showed increased risk of mast cell tumors in neutered males, increased risk of hemangiosarcoma in neutered females, and increased risk of lymphoma in neutered animals of both genders. They also reported increased risk of behavioral disorders in males and females neutered prior to 6 months of age. The overall incidences of cancer and behavioral disorders were 24.1% and 25.9%, respectively. These numbers seem high and may reflect higher survey responses from owners whose dogs suffered from a disorder. A prospective behavioral study in German shepherd dogs (Kim et al 2006) showed higher incidence of reactivity to an unfamiliar human and dog in bitches that were ovariohysterectomized compared to intact bitches. However, the age of dogs ranged from five to ten months, which is a common time for onset of behavioral abnormalities, and no data was collected prior to ovariohysterectomy as a control.

Luteinizing hormone (LH), which is produced by the pituitary gland in order to communicate with the gonads, is elevated in neutered animals, particularly females, due to lack of the negative feedback loop from the absent gonad. Many organs and tissues have now been shown to contain LH receptors. It is suspected but as yet unconfirmed that this may affect risk of certain diseases in neutered versus intact animals.

Anesthetic and surgical considerations
Shelter veterinarians who routinely perform pediatric neuters (<3-4 months of age) report that the surgery is faster, easier, and the animals recover more quickly than those neutered at older ages. Pediatric patients may require amended anesthetic protocols and additional warming measures due to immature hepatic and renal function, low body fat, and high body surface to volume ratio, which contributes to heat loss.

Exposure to infectious diseases while in a veterinary facility is a concern for these patients as they are not yet immunocompetent and have not received a full series of vaccinations.

Animals neutered at 5-12 months of age can typically utilize routine anesthetic protocols. They should have completed routine vaccinations so exposure to infectious disease is less of a concern. It may be more difficult for owners to restrict activity post-operatively in an active, “teenage” dog.

The complication rate for ovariohysterectomy is higher with increased age, size, and body condition of the bitch. Bitches that have been through multiple heat cycles, especially those that have not carried a pregnancy, can have tight, fibrous ovarian pedicles which are difficult to break down for adequate surgical exposure. This increases the risk of hemorrhage and incomplete removal of the ovaries. The uterine body and supplying vessels are also larger and more friable. The presence of intraabdominal fat complicates exposure and ligation of tissues. This author has seen remarkable amounts of fat around the ovarian pedicles even in bitches that are in lean body condition. Older animals may also develop cardiac or metabolic diseases that cause anesthetic concerns.
The technique of neutering males dogs does not vary significantly with age. Scrotal incision are being used more commonly in young males, especially in high volume clinics. In older and larger males, the vascular supply to the testes is correspondingly larger, though ligation is typically not the concern that it is in bitches because of ease of exposure and access in the male. Mature males are more likely to develop scrotal edema post-operatively; scrotal ablation can decrease this risk.

Options for sterilization
Ovariohysterectomy is the traditional spay in which both the ovaries and uterus are removed. Varying amounts of the uterus may be left behind depending on surgical technique. These bitches will not have estrus cycles, and the risk of pyometra and ovarian neoplasia are eliminated. The risk of uterine neoplasia is significantly reduced, dependent on how much tissue remains. The risk of mammary cancer may be reduced depending on age at time of surgery.

Ovariectomy is the removal of the ovaries while leaving the uterus in place. These bitches will not have estrus cycles because the source of hormones (the ovaries) are gone. The risk of pyometra is eliminated, except in uncommon cases of exogenous hormone exposure. The risk of ovarian cancer is eliminated; the risk of uterine cancer is unknown, but is likely reduced due to removal of ovarian hormones. Mammary cancer risk may be reduced depending on age at time of surgery.

Hysterectomy, also called ovary-sparing spay (OSS), is the removal of the uterus while leaving one or both ovaries in place. These bitches will still have estrus cycles and be receptive to breeding, however they will not have significant vaginal discharge associated with the cycles. This can make it difficult for owners to identify when the bitch is in heat and manage her appropriately. OSS bitches may not be allowed at boarding kennels, doggy daycares, and certain dog sporting events when they are in heat. In this procedure, the uterus must be removed completely to the level of, and often including, the cervix. Any endometrial tissue left will respond to the cycling ovarian hormones and put the bitch at risk for a “stump” pyometra. Bitches will stand for breeding during estrus; anecdotally, cases of vaginal rupture have occurred with these breedings, suspected to be due to the shortened and less elastic vaginal vault. The risk of ovarian cancer and mammary cancer are unchanged from a fully intact bitch. Bitches do not go through menopause and will continue to cycle throughout their lives. It may become necessary to perform a second surgery for ovariecotmy on these bitches later in life.

Castration is the removal of the testes. In mature dogs, testosterone returns to basal levels within 30 days of castration. Pre-existing BPH resolves in 30-60 days, and the risk for future BPH or testicular neoplasia is eliminated. Prostatic neoplasia is still a concern in neutered males. It is believed to be less likely in males neutered after maturity than in males neutered pre-pubertally, but this has not been definitively shown.

Vasectomy is a procedure wherein the vas deferens is transected, typically with a short segment removed, to prevent ejaculation of sperm. This eliminates the male’s ability to impregnate a bitch. These dogs will still produce testosterone and exhibit stereotypical male behaviors, including interest in bitches and the ability to copulate. Sperm production may eventually cease due to back pressure from the blocked vas deferens. The risk of BPH is unchanged from a fully intact male.

There are hormone preparations for temporary control of fertility in dogs. Mibolerone, an androgen, can be administered to bitches daily to shut down ovarian activity. If used for less than a critical time, usually two years, fertility should return when the medication is discontinued. Megestrol acetate, a progestogen, can be administered at the start of a bitch’s heat to temporarily prevent ovulation. This is not recommended for prolonged use and is contraindicated in bitches with a history of pyometra or cystic endometrial hyperplasia (CEH). Deslorelin, an GnRH agonist, is available in Europe as an implant for male and female dogs that will block fertility for 6-12 months, depending on dose. Its off-label use is strictly regulated in the United States and thus not practical for use at this time.