

## ***What neutering involves, and the health benefits and disadvantages which may result from neutering your dog***

There are a number of reasons why dog owners choose to neuter their pet with the prevention of puppies being high up on this list, however, the topic itself is a highly emotive one. This subject has to be dealt with rationally as there are health benefits as well as disadvantages to neutering. However, before we delve into the 'pros and cons' let us have a look at what neutering involves.

Neutering is the general term to describe either spaying or castration which are the processes of female and male animal sterilization. **'Spaying'** (medically referred to as ovariectomy) involves the removal of the ovaries, fallopian tubes and uterus. The surgery itself involves making an incision on the underside of the bitch so that the abdominal cavity is entered. Once the ovaries are located, their blood vessels are tied off, followed by tying off of the cervix blood vessels. The uterus and ovaries are then removed and the incision is closed. Spaying not only prevents the bitch from becoming pregnant, but it also eliminates the twice-yearly heat cycles, and the surgery removes the source of production of hormones such as estrogen and progesterone. These hormones are responsible for stimulating and controlling heat cycles and play a major role during pregnancy. Furthermore, these hormones also have other effects on behaviour and on the body, and some of them are potentially harmful.

**'Castration'** (medically referred to as orchidectomy or orchiectomy)<sup>1</sup> refers to the removal of a male dog's testicles. The surgical procedure involves a patch of hair between the dog's scrotum and prepuce being clipped and the skin is scrubbed clean, then the veterinary surgeon pushes the testicles up to the prepared site and makes an incision into the skin. The testicles are pushed up through this incision one by one and blood vessels clamped and tied off. Then the testicle can be removed safely before closing the wound. Both spaying and castration surgeries are carried out under general anaesthetic, once the pet has been neutered there is no turning back, as the procedure is irreversible.

There is no doubt that sterilization helps reduce the problem of unwanted or unplanned litters. According to The Dog's Trust, 105,068 stray dogs were picked up in the UK in 2007, with 7,892 dogs destroyed unnecessarily. These disturbing statistics are why many rescue organisations have a neutering policy. The Dog's Trust alone neutered over 40,000 dogs in 2005, and this increased to 180,003 for 2006, following a countrywide neutering campaign throughout its centres.

There are a number of **health benefits as well as disadvantages to neutering**. For **female dogs** the number of health benefits associated with spaying may exceed the associated health problems in some cases. So, let us look at the benefits.

Bitches come into heat typically twice a year and the season lasts for approximately three weeks. Owners have to contend with **vaginal bleeding** that lasts around four to thirteen days. From a hygiene point of view, this can be frustrating for a dog owner if the dog spots on the furniture or flooring. From a health perspective, some bitches fail to go out of their heat cycle correctly which can cause a condition called '**false pregnancy**' (referred to medically as pseudopregnancy)<sup>2</sup>. Even though the bitch may not have been mated with a dog, the bitch's body believes it is pregnant due to incorrect hormonal stimulation. The intensity of the signs of a false pregnancy varies, some female dogs may have abdominal swelling or enlarged mammary glands, and others may experience a loss of appetite or produce milk. While some females do not experience long-term effects, in other cases bitches may experience problems such as '**mastitis**', an infection of the mammary glands or '**metritis**', an infection of the uterus.

In some cases, infection in the uterus can lead to '**pyometra**' which is a serious condition that can become life-threatening if untreated. Pyometra comes from the Greek words '*pyon*' meaning pus and '*metra*' meaning womb and literally means 'pus in the womb'. Pyometra occurs as a consequence of hormonal changes affecting the lining of the uterus. A common sign is a discharge from the vagina, this can be bloody or yellow/cream coloured. In some cases pyometra is 'closed' meaning there is no discharge and this can cause blood poisoning. If untreated pyometra can lead to life-threatening conditions and cause death from dehydration, blood poisoning and kidney failure. Spaying nearly eliminates the risk of pyometra, which otherwise would affect about 23 per cent of intact female dogs and kills approximately 1 per cent of intact females.

Spaying female dogs greatly reduces the risk of **mammary tumours**, the most common malignant tumours in bitches. It also eliminates the risks of **uterine or ovarian cancers** due to the removal of these susceptible organs, eliminates **eclampsia** or 'milk fever' caused by low calcium following a litter, and **uterine torsion**, where the uterus filled with fetuses twists upon itself blocking the normal fetal passage from the uterine horns into the birth canal.<sup>3</sup> Spaying also reduces the risk of '**perianal fistulas**', also referred to as furunculosis; chronic lesions that occur around the dog's anus that are painful.<sup>4</sup>

Furthermore, female dogs that no longer cycle are fair less likely to suffer from **vaginal prolapse** or **vaginal cysts** (as these are hormonally based), as well as **uterine rupture** and **uterine proplapse**.

Having considered the health benefits of spaying, let us look at the **positives of castration** in dogs. Neutering male dogs eliminates the small risk of dying from **testicular cancer** (estimated at less than 1 per cent in intact males)<sup>5</sup>; this is because the

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<sup>2</sup> Book: Turner, Trevor (1990) *Veterinary notes for dog owners*, Popular Dogs Publishing, chapter 11, page 181.

<sup>3</sup> Book: Rice, Dan (1996) *The complete book of dog breeding*, Barron's Educational Series, chapter 'Dystocia Difficult Birth', page 90.

<sup>4</sup> Internet: Nash, Holly (2008) article on Perianal fistulas in dogs, PetEducation.com, Foster & Smith Inc. Website: <http://www.peteducation.com/article.cfm?cls=2&cat=1592&articleid=2921>

<sup>5</sup> Article: Sanborn, Laura (14<sup>th</sup> May, 2007) *Long-term health risks and benefits associated with spay/neuter in dogs*, Rutgers University.

testicles are removed as part of the neutering procedure. There are three common types of testicular tumor: **Sertoli cell tumors**, **Leydig cell tumors**, and **seminomas**. Sertoli cell tumors secrete estrogen the female hormone, dogs with excessive secretion or intake of estrogen may develop a condition called **hyperestrogenism**; where the dog displays female physical and sexual traits. While Leydig cell tumors can cause **hernias** and **prostatic disease**.<sup>6</sup> Castration helps reduce the risk of non-cancerous prostate disorders. Prostate disorders are primarily a problem in middle-aged to older male dogs that have not been neutered. There are three major types of prostatic disease; **benign prostatic hyperplasia**, **prostatic inflammation** and **prostatic tumours**. The most common prostate problem is benign prostatic hypertrophy also referred to as BPH; up to 80 per cent of adult dogs over five years have some degree of prostatic hypertrophy.<sup>7</sup> In this condition, the prostate gland has increased in size over time because of exposure to the male hormone testosterone, and this may result in the dog having difficulty in defecating or urinating. The prostate gland can also become larger in cancer or infection, known as **prostatitis**, and consequently the constipation and straining resulting from an enlarged prostate may contribute to the development of **perineal hernias**. These occur most commonly in uncastrated male dogs from seven to nine years of age.<sup>8</sup> As with spaying, another health benefit of castration is that it reduces the risk of **perianal fistulas**.

So, what are the **health risks to neutering**? Common issues for both male and female dogs following neutering may include the increased risk of **osteosarcoma** (bone cancer), a common cancer in larger breeds such as Rottweilers and Wolfhounds. According to an article in Cancer Epidemiology Biomarkers and Prevention, data was collected from owners of 683 Rottweiler dogs living in North America, to determine whether there was an association between endogenous sex hormones and the risk of bone cancer. The results concluded that neutering a male Rottweiler before a year of age quadrupled his chances of getting osteosarcoma. Neutering a female Rottweiler before a year of age more than tripled her rate of getting bone cancer. While the risk of osteosarcoma in a purebred dog if it is spayed or castrated before a year of age, more than doubled its chances.<sup>9</sup> Furthermore, the research suggested there was an increased risk of **orthopedic disorders** and **hip dysplasia**.

A recent study of 200 dogs conducted by Margaret V. Root Kustritz, a veterinary reproduction specialist at the University of Minnesota, suggests that neutering may increase the risk of **cardiac hemangiosarcoma** by five times for spayed females compared to unspayed dogs, and by nearly two and a half times in castrated males compared to intact male dogs<sup>10</sup>. Medical evidence also suggests that neutering may increase the risk of **splenic hemangiosarcoma**; both cardiac and splenic hemangiosarcoma are aggressive cancers that prey on blood vessels and can spread rapidly causing tumours almost anywhere in the body.

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<sup>6</sup> Book: Fossum, Theresa Welch (1997) *Small Animal Surgery*, Mosby Inc, chapter 28, page 660.

<sup>7</sup> Book: Turner, Trevor (1990) *Veterinary notes for dog owners*, Popular Dogs Publishing, chapter 12, page 218.

<sup>8</sup> Article: Belen, J and Brady, C.M (2008) *Benefits of castration in male dogs*, Animal Sciences, Purdue University, no.AS-562-W, page 1-2.

<sup>9</sup> Article: Cooley, Dawn et al (Nov 2002) *Endogenous Gonadal Hormone Exposure and Bone Sarcoma Risk*, Cancer Epidemiology Biomarkers & Prevention, Vol.11, pages 1434-1440.

<sup>10</sup> Article: Campbell-Thornton, Kim (19<sup>th</sup> May, 2008) *Pet sterilization laws raise health concerns*, MSNBC Interactive. Website: <http://www.msnbc.msn.com/id/24597888/>

Cardiac hemangiosarcoma is a fairly common cancer and is a major cause of death in some breeds such as Golden Retrievers and German Shepherds.<sup>11</sup> It is commonly detected in the advanced stage, making this condition virtually a silent killer.

Neutered dogs may be more susceptible to **diseases of the endocrine glands**. Endocrine glands include the pituitary gland, the pancreas, ovaries, testes, thyroid and adrenal glands. The commonest endocrine gland disease in both female and male dogs is **hypothyroidism** (insufficient production of thyroid hormone by the thyroid gland)<sup>12</sup>; neutered dogs are more susceptible to this disease than intact ones.<sup>13</sup> Many dog owners also complain of **weight gain** in their male and female dogs following neutering. While the risk of obesity may be increased following this procedure, dog owners can avoid weight problems by following a balanced diet and ensuring their pet receives an appropriate level of exercise.

Other common issues of neutering include the increased small risk of **urinary tract cancers** and **orthopedic disorders**, and **possible anesthesia shock**. However, in a young fit dog the risk of this is very low. Additional health risks include **surgical complications** such as infection or for male dogs bleeding into the scrotum and herniation,<sup>14</sup> (again the risk of these are low), plus **post operative pain** and the potential **risk of adverse reactions to vaccinations** following the procedure.

Male specific issues that may be precipitated by neutering include the increased small **risk of prostate cancer** (less than 0.6 per cent in dogs)<sup>15</sup> and **progressive geriatric cognitive impairment**, which may cause changes in behaviour including disorientation and sleep-wake cycles.<sup>16</sup> Research conducted by Benjamin Hart at the University of California in 2001, suggested that the presence of circulating testosterone in intact males actually slows the progress of cognitive impairment.<sup>17</sup> Some articles from anti-castration groups such as 'Neutering NOT Org', also suggest castration in dogs may lead to respiratory disorders. However, I was unable to substantiate this claim, other than reports of respiratory difficulties in a study of 68 human castrates. Interestingly, this report also indicated that out of the 68 castrates studied, 80 per cent had varying signs of osteoporosis verified by x-ray,<sup>18</sup> a risk associated with neutered dogs.

Health risks specific to female dogs include increased **risk of urinary incontinence** by 4 to 20 per cent of spayed females.<sup>19</sup> Consequently, veterinarians typically suggest allowing the bitch to have one season before she is spayed to reduce the risk of incontinence (and obesity). Other potential disadvantages are the increased **risk of**

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<sup>11</sup> Internet: Information on Hemangiosarcoma from Canine Cancer Awareness, based in Brooklyn New York. Website: <http://www.caninecancerawareness.org/html/CanineCancerHemangiosarcoma.html>

<sup>12</sup> Internet: Wikipedia, search on 'Hypothyroidism'. Website: <http://en.wikipedia.org/wiki/Hypothyroidism>

<sup>13</sup> Internet: Hines, Ron (24<sup>th</sup> April, 2006) Article on Care of Hypothyroid Dogs. Website: <http://www.2ndchance.info/doghypothyroid.htm>

<sup>14</sup> Internet: Brooks, David (2008) Neutering your dog: why, when, how, Ezine Articles. Website: <http://ezinearticles.com/?Neutering-Your-Dog:-Why,-When-and-How&id=383385>

<sup>15</sup> Article: Sanborn, Laura (14<sup>th</sup> May, 2007) Long-term health risks and benefits associated with spay/neuter in dogs, Rutgers University.

<sup>16</sup> Internet: Article by Halevy, Shira (12<sup>th</sup> June, 2007) Cognitive dysfunction syndrome in aging dogs, The Koret School of Veterinary Medicine, Isreal. Website: <http://departments.agri.huji.ac.il/vetschool/students/seminars/shira-benhalevy12-06.htm>

<sup>17</sup> Article: Belen, J and Brady, C.M (2008) Benefits of castration in male dogs, Animal Sciences, Purdue University, no.AS-562-W, page 2.

<sup>18</sup> Book: Langevin, Ron (1983) Sexual strands, Lawrence Erlbaum Associates, section 1, page 60.

<sup>19</sup> Article: Sanborn, Laura (14<sup>th</sup> May, 2007) Long-term health risks and benefits associated with spay/neuter in dogs, Rutgers University.

**vulva, vaginal dermatitis** and **vaginitis** for females spayed before puberty. Case studies from the University of Florida, backs this suggestion; over a period of 18 months the University's Small Animal Reproduction Clinic dealt with 27 cases of spayed females exhibiting vulva, vaginal dermatitis and vaginitis problems.<sup>20</sup> Although uncommon, there have been cases of **stump pyometra** in females that have been spayed. Stump pyometra is where a small remnant of the womb remains due to an incomplete ovariohysterectomy, and the segment within the body becomes infected. This condition is less severe than pyometra but nevertheless needs veterinary treatment.<sup>21</sup>

Although not a health risk, some dog owners have also reported changes in their female dog's coat after spaying. Coats may appear thinner or woollier depending on the breed.

So what are the **possible behavioural changes** one might expect from neutering? Spaying removes the source of estrogen and progesterone. During ovulation estrogen levels rise, then after ovulation progesterone becomes the dominant female hormone. These surges in hormones may affect a female dog's behaviour from showing signs of **nesting**, such as snuggling up against toys perhaps even licking and grooming them. Some females may also display a **reluctance to go out** - borne out of the fear of leaving imaginary puppies, while others may become **aggressive and territorial**.<sup>22</sup> Behaviours that may also be displayed include; **guarding items** such as owner's possessions or the dog's toys, **increased irritability**, **potential fighting** with other dogs and a **reduction in energy levels**. A surge in estrogen can also promote **increased urine output and marking, vocalization** and **nervous arousal** in females.<sup>23</sup> This may lead to the bitch attempting to escape the house or garden in search of male dogs. Hormonal fluctuations may also affect the intact female's eating patterns; some bitches may go off their food or become '**picky**' eaters around their twice yearly surge of progesterone. As spaying stops the bitch's cycle and removes the source of estrogen and progesterone, it is possible that these unwanted behaviours are reduced or perhaps eliminated.

Castration in male dogs is typically recommended when a dog displays unwanted behaviour that is sexually dimorphic<sup>24</sup>; meaning behaviour that is more typical of one sex than the other. Such behaviour may include; **territorial marking, mounting and roaming** away from the house or garden to find potential mates. Some dogs may even **howl** or go **off their food** once they have picked up the scent of a female dog in heat, as the instinct to copulate kicks in. Male sex hormones such as testosterone have a number of behavioural influences in male dogs. For example, **aggressive behaviour** towards dogs is more common in male dogs than females, suggesting the important influence sex hormones, like testosterone, has on dog behaviour. Studies of 206 dogs made by Roll and Unshelm published in 1997, found that intact males were the most common aggressors and targets of attack.<sup>25</sup> These results support findings by Hart, following an extensive survey on the effects of castration. Hart noted that inter-male

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<sup>20</sup> Internet: Slides from talk given by Dr. Karine Verstegen-Onclin, Small Animal Reproduction Clinic, VMC – University of Florida, page 6, slide 11. Website: <http://www.cdoca.org/health%20articles/SN%20-%20Effects%20on%20Urogenital%20System.pdf>

<sup>21</sup> Internet: Article by Kennedy, Shawn (13<sup>th</sup> August, 2004) Pyometra, The American College of Veterinary Surgeons. Website: <http://www.acvs.org/AnimalOwners/HealthConditions/SmallAnimalTopics/PyometraDogsCats/>

<sup>22</sup> Book: Turner, Trevor (1990) Veterinary notes for dog owners, Popular Dogs Publishing, chapter 11, page 181.

<sup>23</sup> Book: Lindsay, Steven (2001) Applied dog behaviour and training, Blackwell Publishing, chapter 6, page 182.

<sup>24</sup> Article: Belen, J and Brady, C.M (2008) Benefits of castration in male dogs, Animal Sciences, Purdue University, no.AS-562-W, page 1.

<sup>25</sup> Journal: Roll, A. and Unshelm, J (1997) Aggressive conflicts amongst dogs and factors affecting them, Applied Animal Behaviour Science, Elsevier, vol.52, page 229-242.

aggression was reduced in 60 per cent of cases, showed a rapid reduction in 25 per cent of cases, a gradual reduction of 45 per cent of cases and in 10 per cent of cases castration had no effect on inter-male aggression. This research also indicated that in 25 per cent of dogs displaying aggression toward family members, the dogs' behaviour improved by 50 per cent and 90 per cent after castration. Furthermore, Hart found in about 70 per cent of the dogs engaging in objectionable behaviour such as urine marking, mounting and roaming, there was at least a 50 per cent improvement and in 30 per cent of the dogs studied, there was a 90 per cent improvement.<sup>26</sup> Urine marking and copulatory behaviour such as mounting are typically perceived as acts of dominance (some suggest that urine marking is a precursor of territorial aggression).

Within the emotive subject of neutering, is the question of when is the most appropriate age to spay a bitch or castrate a dog? Male dogs experience surges of testosterone before and again after birth which, in essence 'masculinizes' the brain and sets up potential behaviours. Male dogs then have another surge at puberty, for small breeds this is typically around six to nine months, and in larger breeds around nine to twelve months.<sup>27</sup> Many veterinary specialists suggest that if castration is to place, then possibly the most ideal time is around six months of age, before any hormone induced behaviours may become learnt behaviour. There is also a suggestion that in order to reduce any possible risk of unwanted sexual and aggressive behaviours in later life, prepubertal castration is the answer. This idea is borne out of research conducted by Leo Lieberman who studied 400 dogs; of these, 200 dogs were castrated at six to twelve weeks of age and the remaining 200 dogs were castrated after six months. Lieberman's results indicated that the unwanted sexual and aggressive behaviours were significantly reduced in the prepubertal castrated puppies compared to the dogs castrated after six months of age.<sup>28</sup>

While male dogs experience a 'masculinization' of the brain during the neonatal period, bitches do not have a 'feminizing' experience at birth. However, from a behavioural aspect, spaying a bitch immediately following her cycle or within two months of her cycle is not typically advised. The reason for this is that the hormone progesterone, which has a calming affect, surges and becomes the dominant hormone over estrogen following a cycle. Spaying while there is a high level of progesterone in the body may increase the risk of unwanted hormone-related behaviours such as anxiety, depression or aggression kicking in. Therefore, many veterinary specialists suggest spaying a couple of months after the female dog has had her first season, when the dog is around six months of age. This greatly reduces the risk of unwanted behaviours developing and becoming established or learnt, as well as reducing the risk of incontinence and obesity developing in later life.<sup>29</sup>

### **My personal view:**

In determining whether to neuter a bitch or dog, the owner needs to consider the potential health benefits and disadvantages before considering the behavioural issues. For bitches, the medical benefits appear to outweigh or are equal to the risks.

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<sup>26</sup> Book: Hart, Benjamin and Bain, Melissa (2006) *Canine and feline behaviour therapy*, Blackwell Publishing, chapter *Hormones and Behaviour Gonadectomy*, page 56.

<sup>27</sup> Book: Fogle, Bruce (1992) *A dog's mind*, Pellham Books, chapter 4, page 53-54.

<sup>28</sup> Article: Lieberman, Leo (September 1987) *A case for neutering pups and kittens at two months of age*, *DVM Journal of the American Veterinary Medical Association*, Vol.191, no.5. *Pediatric Spay/Neuter Veterinary Journal Summaries*.  
Website: <http://www.columbusdogconnection.com/Documents/PedSNVetJournals%5B1%5D.pdf>

<sup>29</sup> Internet: Pearce, Owen, Penmellyn Veterinary Group, *Dog castration and neutering the female dog fact sheet*.  
Website: <http://www.penmellyn.co.uk/animals/dogs/main.htm>

Behavioural changes in the female dog resulting from spaying also appear to be relatively minor. Therefore, if the owner decides that they wish to prevent an unwanted pregnancy, then spaying, in my opinion, is desirable.

The issue is more complex when considering neutering for dogs. There are medical benefits from castrating a dog but also substantial medical disadvantages and potential long-term health problems. However, research suggests that castration can reduce undesirable sexually dimorphic behaviour, notably inter-male aggression, mounting and roaming, providing castration is conducted at an early age. Castration in dogs, particularly older dogs (post puberty) needs to be carefully considered and, in my opinion, only be considered when other potential sources (e.g.) training, have already been addressed.

In conclusion, the extent at which neutering is effective for reducing unwanted behaviour in male and females, or is a risk to health, I believe, depends on the problem as well as the size, sex and age of the dog when the surgery is performed.