Is there a 'best' time for neutering dogs or should we be neutering them at all?

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For clarity, in this article the term neuter is used to mean a surgical procedure carried out in order to reproductively sterilise both male and female dogs. The term castration is used to mean the removal of male dogs' testicles. The term spay is used to mean the removal of female dogs' ovaries alone (ovariectomy), or the surgical removal of female dogs' ovaries and uterus together (ovariohysterectomy).

Those working with dogs professionally including trainers, behaviourists, breeders and vets often hold strong views on neutering much of which is probably based on anecdote, opinion and handed down tradition with little solid evidence for or against. The purpose of this article is not to make any recommendations for neutering or against it, but to present a summary of some of the science we do have on the pros and cons of neutering dogs.

There have been enormous advances in anaesthetic techniques over the last decade or so, nonetheless there will always remain inherent risks in all surgical procedures including the neutering of dogs. However, left unneutered and to their own devices dogs will be dogs and there are also inherent risks in procreation, especially in pregnancy. Among mammals dogs show the greatest phenotypic diversity on the planet and with dogs of every size and shape it comes as no surprise that dystocia (difficult labour) is a very common

complication for some breeds, most of which require a caesarean section to deliver the puppies. Unlike routine spaying, a whelping cannot be a precisely planned and prepared-for event and therefore the surgical procedure will be inherently more risky for the bitch and of course the puppies. In terms of the overall welfare of the dog population the most compelling reason for supporting neutering is the number of dogs being abandoned in UK. A 2011 report compiled by the charity Dogs Trust came up with a figure of 126,176 dogs per year, a staggering 345 dogs every day. With figures like these there is no place

any more in our society for the 'casual litter of pups' and the sentiment so often expressed by our children 'Please Mummy, can we have just one litter of puppies?'.

Around the world attitudes and approaches to neutering of dogs vary enormously. Here in the United Kingdom and in the United States neutering is a routine part of (responsible) dog ownership and in the UK we neuter more of our pets than anywhere else in the world. In other European countries like Germany and the Scandinavian countries (Norway, Sweden, Denmark, Finland and Iceland) neutering pets is considered a mutilation and is illegal. In addition early neutering of puppies at 8 weeks old is routine in the United States, whereas here in the UK the British Veterinary Association state "at the current time there is insufficient scientific data available to form a position on the early neutering of dogs and bitches."

In the UK about 54% of dogs are neutered. When it comes to professional advice about the 'best' time to have their dog neutered, there is currently no clear consensus within the veterinary profession which has given rise to owners across the country being given a range of opinions. One survey found that about 72% of vets 'always' recommend spaying if the dog is not to be used for breeding (the other 28% recommending it 'mostly', 'sometimes' or 'rarely'). And 16% of vets 'always' recommend spaying before the first season (the other 84% recommending it 'mostly', 'sometimes', 'rarely' or 'never'). According to another source most veterinary practices recommend neutering of both sexes between '6 months and 2 years of age'. Interestingly vets practicing in urban areas neuter more dogs and at a younger age than those in rural areas who are more likely to recommend a bitch 'has her first season" before spaying.

There is varied and often conflicting information on the influence of neutering on dogs' behaviour and the development of behaviour problems. This is in part

because how dogs interact and behave is very much shaped by their circumstances and environment. But in addition there have been no epidemiological studies specifically looking at both normal and abnormal behaviour in large populations of dogs over their lifetimes. The only data we have are from relatively small owner-questionnaire surveys focusing on specific behaviour problems, such as aggression, and data collected by behavioural referral clinics, for example in university departments, neither of which properly represent the normal dog population at large. However, we can still draw some useful information from the data we do have. There have been many studies focussing on aggression in dogs and most of these make a causal link with intact male dogs. Several studies have reported significant reductions in roaming (e.g. 90%), dog-dog aggression (e.g. 60%) and mounting (e.g. 80%) after castration. In the same studies this pattern is reversed for female dogs where there is a higher incidence of aggressive behaviour among spayed dogs compared with intact bitches. There is also some evidence that spaying bitches that have already shown aggression towards their owner before six months old exacerbates the problem.

This is supported by a study that showed that neutered German Shepherd dogs were more reactive around unfamiliar people and dogs than intact German Shepherd dogs. Other studies have shown that castrated dogs are more excitable than entire dogs and neutered dogs are more 'active' than intact dogs.

There are no studies in dogs investigating the role of sex hormones in the development of the brain in puppies, but we do have many studies in other mammals. What we do know is that, beyond their role in sex and sexual behaviour, both male and female sex hormones are crucially important in the emotional development of the young. We also know that many of the on-going day-to-day cognitive functions in adults such as learning and memory, attention and processing of emotional events are modulated by the sex hormones. What effects, if any, neutering may have on dogs' cognitive performance is currently not known. A study on age-related cognitive impairment comparing populations of older neutered and intact dogs suggested that circulating testosterone in

entire male dogs has a protective role in the progress of the disease. No conclusions could be drawn for females as there were not enough intact dogs in the study.

Several studies suggest a link between neutering, including age of neutering, and an increased likely-hood of 'at risk' dogs developing hip dysplasia that requires some form of treatment. At risk dogs include the larger breeds where the estimates of occurrence have been quoted as high as 75%, but of course around 5% of these dogs will show physical signs of lameness. Hip dysplasia affects less than 1% of small breeds. The reason why neutering can have a negative effect on hip dysplasia outcomes is not clear, but it may be an indirect effect as a result of weight gain in some dogs later on. Likewise neutering could increase the incidence of cranial cruciate disease in larger dogs, especially those neutered before 6 months of age, probably because of a negative effect on the shape of the still-developing stifle joint. A recent study of common disease in Golden Retrievers compared the incidence of these diseases in dogs neutered before 12 months old with dogs neutered after 12 months old. The incidence of hip dysplasia and cranial cruciate disease was higher in early-neutered males and females. Osteosarcoma is a very serious cancer of the long bones in predominantly larger dogs with an incidence rate of as high as 6%; one study found an incidence of 12% in Rottweilers. It appears that neutering increases the risk of developing osteosarcoma in large breeds of dogs and the primary factor is neutering before sexual maturity. Thereafter, the negative affect of neutering on osteosarcoma risk decreases the longer a dog remains intact, although there is some doubt in the interpretation of this data.

Although considered to be an entirely preventable disease irrespective of cause some studies have shown an overall lowering of metabolic rate in neutered dogs, but other studies have found no difference. However, some neutered dogs do seem to change their feeding habits and consistently consume more calories than their un-neutered counterparts. Linked to increased weight of course is an increased risk in orthopaedic diseases, such as cranial cruciate disease and hip dysplasia, and other metabolic diseases like diabetes. Any direct link between

neutering and risk of developing diabetes in dogs is not known, although there is a clear link in female cats in particular arising as a result of the abolition of some protective regulatory effects of the female sex hormones on insulin.

Incontinence of the urinary bladder is a common complaint in spayed female dogs with a reported frequency of between 5 to 30% in smaller to larger breeds respectively. UK vets cite urinary incontinence as the second most common disadvantage of spaying, and for owners it is a condition that generally requires life-long treatment, with some dogs not responding at all well to the available medical treatments. A review of all the available evidence on spaying and urinary incontinence was published last year. The conclusions drawn from the accumulated data were that spaying does increase the incidence of urinary incontinence. There is evidence that the risk of urinary incontinence decreases as the age of spaying increases. There is no evidence that having a first season or not before spaying increases the risk of urinary incontinence. The authors caution however that overall the quality of the data is too weak to draw any strong conclusions either way and that more specific research is recommended.

A university study of recurring urinary tract infections, or cystitis, in 11,000 dogs found an increased incidence of the disease in spayed female dogs, but not in neutered male dogs. Other studies have found no such relationship with neuter status however.

Hypothyroid disease is a relatively rare disease of the thyroid gland found in around 0.25% of dogs that results in decreased levels of circulating thyroid hormone. A number of studies have found an increased incidence of the disease in neutered dogs compared with unneutered dogs, although other studies have found no such link. A few studies have reported a higher instance of pancreatitis in neutered dogs. Although the true incidence of pancreatitis in dogs is not known, different surveys have yielded figures ranging from less than 1% to over 50%.Tumours of the reproductive tract, including the ovaries, uterus and vagina are rare in dogs accounting for between 0.5% and 6% of all canine tumours, and clearly spaying a bitch reduces this risk to zero. Tumours of the vulva represent about 2% of all canine tumours and these occur most commonly in unspayed bitches.

The physiology of the bitch's oestrus cycle predisposes nearly 30% of dogs to develop a pyometra, which is a post-oestrus infection of the uterus, at some time in their lives. Some breeds are more susceptible than others and of course the risk increases with age, or number of oestrus cycles experienced if you prefer. Pyometra can be effectively treated with medication in some cases, but spaying a bitch is the better option

because it also prevents a recurrence of the disease. Both ovariectomy and ovariohysterectomy are equally effective.

Benign prostatic hyperplasia (BPH) is a progressive enlargement of the prostate gland with age. The incidence in intact dogs of less than 7 years of age ranges from 15% to 40%, while in older dogs the incidence climbs to 60% to 100%. Remember though that only some of these dogs will ever develop symptoms of the disease which include abdominal pain and difficulties in urinating, sometimes with blood in the urine and possibly difficulties in defecating as well. Prostatitis is an inflammation of the prostate gland and a much more serious disease with an occurrence of up to 28% in intact dogs. Castration is an effective prevention for both these diseases in most male dogs.

When it occurs, prostate cancer in dogs is a very serious disease with an incidence rate of up to 13%, and 80% of these tumours are malignant and spread to other organs rapidly which is usually fatal. The jury is still out as to whether castration increases, decreases, or has no influence on the predisposition for dogs to develop this disease.

In male dogs, tumours of the testicles ranging from 16% to 25% of all tumours making them the second most common type of tumour. Testicles that have not descended into the scrotum are more likely to develop tumours and of course castration reduces this risk to zero.

Transitional cell carcinoma is a tumour with an incidence rate of between 1% and 2% and occurs primarily of the bladder but is sometimes found in the urethra as well. This tumour is more common in females and some studies report that spaying increases the risk of developing this cancer four-fold.

Some breeds of dogs such as Retrievers, Labradors and German Shepherd dogs, are more likely to develop the aggressive tumour hemangiosarcoma most often in the spleen or the heart. A couple of studies have shown that spaying a bitch doubles her risk of developing the splenic form of this tumour and increases her risk by a factor of 5

for the cardiac form. Castrating male dogs has no such effect on this tumour

Mammary tumours are a common and serious disease, especially in intact bitches with the risk increasing with age, one study showing figures of 1% at 6 years rising to 6% at 8 years and to 13% at 10 years old. Just over half of all mammary tumours in dogs are malignant and in these cases surgery is generally the best treatment, sometimes alongside chemotherapy. However, up to 60% of dogs with malignant mammary tumours will die some short time later despite treatment because the tumour will have already spread to other vital organs of the body. Some studies have shown that spaying is hugely successful at reducing the risk of malignant mammary tumours and the time a bitch is spayed is a significant factor here. One study suggests that spaying before the first season reduces the risk of developing mammary tumours to 0.5%, after the first season this rises to 8% and after the second season and later the risk rises again to 26%. However, these figures are challenged by more recent studies. A review of all the available evidence looking at the effects of spaying on the risk of developing mammary tumours was published last year. The researchers concluded that there was evidence that spaying before 30 months old reduces the risk of the disease significantly. Spaying before the first season reduces the risk even more. However, the authors cautioned that the data was weak and that more research specifically investigating mammary tumours in dogs and the effects of spaying is needed. In male dogs mammary tumours are very rare.

A study looking at the case records of 40,000 dogs spanning 30 years of data from a number of veterinary schools in the USA looked for links between neutering and dog's lifespan and what they found is rather interesting. Castrated males lived 14% longer and spayed females lived 26% longer. There was variation in causes of death as well with intact dogs more likely to have died from infections, trauma, degenerative diseases or vascular disease. Neutered dogs were found to be more likely to have died from immune system related diseases and cancer. These data need to be treated with caution of course because we know nothing about the demographics of these dogs. For example it could be that the higher death rates due to infection and trauma in intact dogs is a result of poorer supervision and veterinary care. At odds with these results are the results of another study of longevity in Rottweilers. This study investigated the impact of having litters on the length of a bitch's life by analysing the life-time records of Rottweilers that had lived more than 30% longer that the breed average compared with Rottweilers that lived an average lifespan. What the researchers found was that having litters did not disadvantage these dogs for a long life. In fact having a 'moderate investment in reproduction' seemed to be an advantage in achieving longevity in these dogs.

So what conclusions can we draw from all this information? It should come as no surprise that there is not a definitive 'yes' or 'no' answer here as to whether we should be neutering our dogs or not. Of course for individual dogs there are both risks and benefits, but for the dog population as a whole, including their relationship with us and with other dogs and canine welfare as a whole in this country, the benefits far outweigh the risks in my opinion.