The Effects of Spaying and Neutering on Canine Behavior

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Spaying and neutering is an often suggested remedy for various behavior problems. This article will be a review of the effects of spaying and neutering on behavior.

Males

Neutering the male dog removes the source of circulating testosterone.

> "Ben and Hart at the University of California carried out the most extensive surveys on the effects of castration on dogs and came up with these statistics:
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> Roaming
> Reduced in 90% of cases
> Rapid reduction in 45%
> Gradual reduction in 45%
> No effect in 10%
>
> Intermale Aggression
> Reduced in 60% of cases
> Rapid reduction in 25%
> Gradual reduction in 35%
> No effect in 40%
>
> Mounting People
> Reduced in 60% of cases
> Rapid reduction in 30%
> Gradual reduction in 30%
> Some decline in mounting bitches in heat too
>
> Urine Marking in the House
> Reduced in 50% of cases
> Rapid reduction in 20%
> Gradual reduction in 30%" (Fogle, 1990, p. 53)

Testosterone has the effect of modulating sexually dimorphic behaviors as well as aggressive or reactive behaviors. "Testosterone acts as a modulator that makes dogs react more intensely. When an intact dog decides to react to something, he reacts more quickly, with greater intensity, and for a longer period of time." (Overall, 1997, p.96)

There is a two fold explanation of the effects of androgens (specifically testosterone) upon behavior which bear upon the affects of castration and behavior: 1) prenatal androgenization of the testosterone sensitive neural substrate which mediate sexual and aggressive behavior and 2) reinforcement and sensitization of these substrates once they have been realized at puberty (Lindsay, 2000, p.186). This is supported by the finding that testosterone can create male sexually dimorphic behaviors when injected into females, and, that male sexually dimorphic behaviors are not eliminated upon castration, even prepubertally.

There are two significant surges of testosterone in the male canine system; one

just before and just after birth, which masculinizes the brain and essentially sets up the potential for associated behaviors, and another at puberty, which further modulates these behaviors. Thereafter the behaviors take on more of a learned component. This first androgenizing effect is not affected by castration, which explains the inconclusive results of castration upon behavior. I would be remiss not to add into this discussion the high likelihood that many male sexually dimorphic behaviors may be modal action patters to some degree. Male urine marking for example is probably a modal action pattern, as is mounting. Roaming is probably instinctive also. As with most canine behaviors it always comes down to a complex amalgam of genetics and learning. Hormonal activity can be affected by neutering but genetics can only be affected in populations (as opposed to individuals). Behaviors that are highly instinctive are difficult to effect with training.

"Testosterone titers start to rise by the time the male pup reaches 4 to 5 months, where after testosterone levels reach a maximum at 10 months of age and then fall to adult male levels by 18 months of age." (Dunbar, 1999, p.68) Raising testosterone levels at 4 to 5 months of age may be important in provoking other dogs to target them so that they will learn affiliative behaviors (Dunbar, 1999, p.68). On the other hand as circulating testosterone levels increase associated behaviors become more learned and entrenched in the behavioral repertoire of the dog. This argues for neutering to be done at 6 months of age in order that affiliative behaviors may be learned through the targeting phenomenon but so that affects of circulating testosterone are not present long enough to cause significant reinforcement histories for associated behaviors. One argument is that dogs who are expected to live with or otherwise interact with other dogs throughout their lives and who are also extra sensitive should be neutered early (say at 4 months) so that they are not targeted quite so heavily by other dogs. Waiting with these dogs can provoke interactions that lead to classical conditioning complications. If a dog is provoked to engage in intermale aggression for example, he may learn from his interactions to anticipate a confrontation. This classical conditioning effect can influence the dog's behavior long after circulating testosterone is removed from the body. This beneficial effect must be weighed against the potentially negative ramifications of prepubertal neutering. Prepubertally neutered dogs show a significant increase in excitability and general activity level (Lindsay, 2000, p.186). For some breeds and some owners this may not be a problem and prepubertal neutering may prevent otherwise difficult to avoid traumatic experiences with other dogs while allowing for maximal socialization. A cost benefit assessment must be made in each case before the timing of neutering can be advised upon. It is also often suggested that puppies who show dominance or high levels of controlling behaviors be neutered early. This may not be based on any valid research. "... prepubertal castration appears to have no effect on the development of canine aggression in males (Le Boeuf, 1970)." (Overall, 1997, p.97)

Females

Spaying of the female dog removes the source of estrogen and progesterone. Estrogen and progesterone are increased or decreased in cycles. The biggest influence cycling fluctuations in estrogen and progesterones have on female dog behavior is pregnancy related problems.

> "While estrogen increases in the dog's body for a short length of time, progesterone remains in circulation, influencing the brain for two months after each estrous and can have a dramatic effect on canine behavior. The most common behaviors are those associated with pregnancy, nest building, guarding possessions and milk production." (Fogle, 1990, p.54)

The most notable problem arises when the dog guards items maternally. Other problems

can involve irritability, conflict with other dogs and energy reduction. "Guarding toys, dolls, rags, slippers or anything else that can be carried is another common behavioral consequence of the surge in progesterone." (Fogle, 1990, p.55) Possessive guarding in intact females that occurs in cycles is usually a hormonal guarding of the type described.

Female dogs are at increased risk of disease if they are allowed to experience their first heat. For this reason it is often suggested that a female dog be spayed prior to 6 months of age. It would appear that dogs who demonstrate control complex aggression (aka dominance aggression) toward owners prior to 6 months of age are at risk for becoming more aggressive after ovariohysterectomy. If a dog demonstrates a significant propensity to control complex aggression it may be wise to avoid spaying these dogs.

> "When the female dogs neutered at or after puberty were compared to intact controls, several differences were noted. One difference was a significantly greater tendency for dominance aggression to be shown toward family members by the neutered females. What is not clear about the study is whether the surgery was performed in more of these dogs because aggression had already been identified as a problem, or whether there is a direct cause-effect relation. Ovariohysterectomized bitches also showed significantly more excitement in the car and less discriminate appetite than did the intact ones, even immediately post surgery." (Beaver, 1999, p.229)

These observations are backed by Fogle, (p. 56) and Overall (p. 97). It remains unclear exactly why some undesirable behavioral side effects occur. Inconclusive evidence exists that androgens may be implicated in dominance aggression in females (Overall, 1997, p.97). Experiments performed on hamsters (Brain & Haug, 1992; Vom Saal, 1984, 1989, as cited in Overall, 1997, p.98) suggest that females positioned in the uterus between two males will be more aggressive than other females and this conflict behavior more resembles male conflict behavior. We know that the male brain is exposed to testosterone prior to birth, which masculinizes the male brain. It is theorized that this masculinizing of bystander females results in aggression in females, again adding to the debate of how important testosterone is in the development of aggression and other behaviors. Animals experimentally injected with testosterone, including females, tend to take on male sexually dimorphic behaviors. It would seem that testosterone may tern out to be very important one way or another in the development of aggressive behavior.

In Conclusion

Neutering can remove one of the influences upon male sexually dimorphic behavior and aggression and while this cannot be considered curative it may help prevent associated behaviors or reduce the modulating effect of associated behaviors that already exist. Timing of neutering may be significant and should be advised upon with a cost benefit assessment on a case-by-case basis.

Spaying will prevent the cycling of estrogen and progesterone, which may prevent associated behaviors. Whether to spay or not should be advised on a case by case basis depending on the presence or absence of significant excessively controlling aggressive behaviors toward owners prior to six months of age.

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