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RESEARCH

Aggressive behavior in the English cocker spaniel

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aggression;
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Abstract A high percentage of aggression problems and a tendency to display noninhibited aggression in the English cocker spaniel (ECS) have been suggested by many authors. The authors of this paper designed a retrospective study to analyze the aggressive behavior of 145 ECSs presented for aggression problems to the Animal Behavior Service at the Barcelona School of Veterinary Medicine's veterinary teaching hospital. Aggressive ECSs were compared with a population of dogs of the same breed presented for a behavior problem other than aggression and with a population of aggressive dogs of other breeds. The most common forms of aggression in the ECS were owner-directed aggression (67.6%), aggression toward unfamiliar people (18.4%), aggression toward unfamiliar dogs (10.1%), and aggression toward family dogs (3.3%). Owner-directed aggression was more common in the ECS than in other breeds, although in similar contexts. In the ECS, the golden coat color was more common in the aggressive dogs than in nonaggressive dogs. ECSs showed impulsive aggression more frequently than aggressive dogs of other breeds. The aim of the study was to analyze cases of aggressive ECSs seen in a referral practice.

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Introduction

The study of canine aggression is important for several reasons. First, it has a large effect on human public health, not only because of the derived economic costs, but also because of the physical and psychological injuries arising from dog bites (Sosin et al., 1992; Mertens, 2002). Second, behavior problems are one of the main reasons for euthanasia and relinquishment of dogs to animal shelters (Patronek et al., 1995; Houpt et al., 1996), and aggression problems are one of the most common owner complaints in

veterinary general practice and in behavior referral practices (Overall, 1997a; Fatjó et al., 2006). Finally, aggression problems could affect the animal's well-being, since there is evidence that aggressive behavior may involve a stress response (Kruk et al., 2004). The study of the mechanisms that control the appearance of aggression and the identification of the risk factors related to aggression are essential to establish effective preventive measures.

Breed-related risk factors can result from genetic predispositions to environmental influences, including early environment and training methods (Mertens, 2002). Scott and Fuller were among the first authors that used an experimental design to show differences in behavior traits between different breeds. Among the different breeds included in their study, fox terriers were the most aggressive, followed by basenjis and Shetland sheepdogs, and finally

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by American cocker spaniels and beagles (Scott and Fuller, 1965). More recently, a survey of veterinarians and kennel club judges suggested breed differences in behavior for 13 behavioral traits, many of them related to aggression. In this study, the English cocker spaniel (ECS) was included in the group of breeds with moderate aggression and high reactivity (Hart and Hart, 1985). Several epidemiologic studies support that some breeds such as the ECS are more prone to display certain forms of aggression than others (Lund et al., 1996; Overall, 1997b; Bradshaw and Goodwin, 1998; Svartberg, 2006; Takeuchi and Mori, 2006).

The temperament of the ECS has been previously assessed through a questionnaire to owners (Podberscek and Serpell, 1996). A first analysis yielded general data on aggressive ECSs, including contexts in which aggression occurred. According to these results, solid-color ECSs were significantly more likely to show aggression than particoloreds, and males were significantly more likely to show aggression than females in the majority of the 13 situations included in the study (Podberscek and Serpell, 1996). Using information from the aforementioned study, dogs were divided into 2 groups of high and low aggression profiles, which were related to the personality of their owners. Solid colors and neutered dogs were more commonly found in the high aggression group. Dogs in the high aggression group reacted more slowly to commands and were more reactive to loud noises (Podberscek and Serpell, 1997a). Regarding personality traits, owners of dogs included in the high aggression group were more likely to be tense, less emotionally stable, shy, and undisciplined (Podberscek and Serpell, 1997b).

Clinical reports from many small animal behaviorists suggest that owner-directed aggression is frequently observed in the ECS (Landsberg, 1991; Beaver, 1994; Pageat, 1998). Further, the ECS may have a characteristic way of expressing this form of aggression; attacks are frequently described by the owner as impulsive and occurring in the absence of a clear triggering event. The term impulsiveness has been described as a lack of warning signals prior to an attack (Peremans et al., 2003). According to some authors, this could be a particular form of competitive aggression (Neville, 1991; Reisner et al., 1996; Pageat, 1998), whereas others suggest the existence of an underlying organic problem (Beaver, 1980; Colter, 1989; Dodman et al., 1992).

Nevertheless, to the best of the authors' knowledge, there are no published quantitative data on the characteristics of clinical cases of aggression in the ECS seen by small animal veterinary behaviorists. The aim of this study was to analyze cases of aggressive ECSs seen in a referral practice to better understand the underlying factors that could influence the expression of this behavior.

Material and methods

To characterize their behavior, 145 ECSs presented for aggression to the Animal Behavior Service at the Barcelona

School of Veterinary Medicine between 1998 and 2006 were studied. The clinical history obtained through a standard questionnaire to the owner provided general information, such as neutering status, age of adoption, source from which the dog was obtained, coat color, and a detailed description of the aggressive episodes and other relevant aspects of the dog's behavior.

The study group was compared with a population of ECSs presented for a behavior problem other than aggression ($n = 28$), as well as with a group of dogs from other breeds with aggression problems ($n = 499$). Both samples of dogs were obtained from the database of the Animal Behavior Service (Universitat Autònoma de Barcelona). Crossbreeds were excluded from the analysis. All dogs were considered healthy based on physical examination, serum biochemistry, and complete blood count. All comparisons were done through chi square tests using SPSS for Windows (version 15.0, SPSS Inc., Chicago, December 18, 2006).

To calculate risk factors for owner-directed aggression in this population, the number of ECSs in the general population was obtained from REIAC (Spanish Network for the Identification of Companion Animals).

Results

In the aggressive ECS group ($n = 145$), 42 (29%) were females (95.2% of which were intact), and 103 (71.0%) were males (92.2% of which were intact) (Table 1). The average age at which ECSs were adopted was 5.6 months. Sixty of them (45.6%) had been purchased from a pet shop, 37 (28.3%) from a private owner, 25 (21%) from professional breeders, 5 (3.6%) had been rescued from the street, and 2 (1.4%) had been adopted from an animal shelter. In relation to coat color, 88 were golden (60.7%), 32 were black (22.1%), 24 were bicolor (16.5%), and 1 was tricolor (0.7%). Mean age at the time of consultation was 3.6 years.

With regard to the population of the nonaggressive ECSs ($n = 28$), 10 were males (9 intact, 1 neutered) and 18 were females (15 intact, 3 neutered). Mean age of adoption was 3.5 months. Six of them (30%) had been purchased from a pet shop, nine (45%) from a private owner, four (20%) from professional breeders, and 1 (5%) had been rescued from the street. Information about the origin of the dog in 8 animals was unknown. With regard to coat color, 11 (42.3%) were golden, 6 (23.1%) were black, and 9 (34.6%) were bicolor. Mean age at the time of consultation was 2.7 years.

Concerning the aggressive non-ECS population ($n = 499$), 354 dogs were males (327 intact, 27 neutered) and 145 were females (131 intact, 14 neutered). Mean age of adoption was 4.6 months. Of all cases where the origin was known ($n = 368$), 89 dogs (24.2%) had been purchased from a pet shop, 132 (35.9%) from a private owner, 126 (34.2%) from professional breeders, 13 (3.5%) had been

Table 1 Study groups

Parameter	Aggressive cockers	Nonaggressive cockers	Aggressive non-ECS population
N	145	28	499
Sex			
Females	42 (28.97%)	18 (64.28%)	145 (29.06%)
Intact	40	15	131
Neutered	2	3	14
Males	103 (71.03%)	10 (35.71%)	354 (70.94%)
Intact	95	9	327
Neutered	8	1	27
Source			
Pet shop	60 (45.65%)	6 (30%)	89 (24.18%)
Private owner	37 (28.26%)	9 (45%)	132 (35.87%)
Breeder	25 (21.01%)	4 (20%)	126 (34.24%)
Street	5 (3.62%)	1 (5%)	13 (3.53%)
Animal shelter	2 (1.45%)	0	8 (2.17%)
Coat color			
Golden	88 (60.69%)	11 (42.31%)	
Black	32 (22.07%)	6 (23.08%)	
Bicolor	24 (16.55%)	9 (34.62%)	
Tricolor	1 (0.69%)	0	
Mean age at adoption (mo)	5.6	3.5	4.6
Mean age at consultation (y)	3.6	2.7	3.2

rescued from the street, and 8 dogs (2.2%) had been adopted from an animal shelter. Mean age at the time of consultation was 3.2 years.

Fifteen percent of purebred dogs presented for behavior problems were ECSs. The main reason for consultation was aggression ($n = 145$; 84%).

Owner-directed aggression was the most commonly reported problem in both populations of aggressive dogs. When the groups were compared, aggression toward the owners was observed more frequently in ECSs than in the other breeds (67.6% vs 36.5%; $\chi^2 = 54.54$; $p < 0.001$). Conversely, the aggressive non-ECS population showed aggression problems toward unfamiliar people (26.4% vs 18.4%; $\chi^2 = 4.76$; $p < 0.02$), family dogs (14.8% vs 3.3%; $\chi^2 = 17.06$; $p < 0.001$), and unfamiliar dogs (21.6% vs 10.1%; $\chi^2 = 12.06$; $p < 0.002$) more frequently than aggressive ECSs (Table 2 and Figure 1). Taking into account that 3.52% of purebred dogs of REIAC (Spanish Network for Dog Identification) were ECS, the risk factor for owner-directed aggression in this population was 10.32.

Aggressive ECSs came more frequently from pet shops than aggressive non-ECS dogs (45.6% vs 24.2%; $\chi^2 = 20.7$; $p < 0.01$). No differences were observed between aggressive and nonaggressive ECSs.

Males were more frequently found in the group of aggressive ECSs (71% vs 29%; $\chi^2 = 12.92$; $p < 0.001$) and in the aggressive non-ECSs population (71% vs 29.1%; $\chi^2 = 24.75$; $p < 0.001$) than females. There was no difference in the percentage of neutered animals among the 3 groups of dogs.

The golden coat was significantly more common in the group of aggressive ECSs than in the group of nonaggressive ECSs (60.7% vs 42.3%; $\chi^2 = 5.03$; $p < 0.03$). No differences were found between the 2 populations of ECSs for the other 2 coat colors (Figure 2).

In the group of ECSs displaying owner-directed aggression ($n = 121$; 67.6%), 82% did so in a context involving food or object guarding, 67.4% when disturbed while resting, 61.4% when handled, 63.6% when punished, and 36% while being petted. No significant differences were detected between aggressive ECSs and aggressive dogs of other breeds in the context in which aggression was

Table 2 Aggression problems according to the owner's complaint

Owner complaint	Aggressive ECSs, n (%)	Aggressive non-ECS population, n (%)
Owner-directed aggression	121 (67.60)	221 (36.47)
Aggression toward unfamiliar people	33 (18.44)	160 (26.40)
Aggression toward family dog	6 (3.35)	90 (14.85)
Aggression toward unfamiliar dogs	18 (10.06)	131 (21.62)
Other	1 (0.56)	4 (0.66)

Note: Each dog could show more than 1 aggression problem.

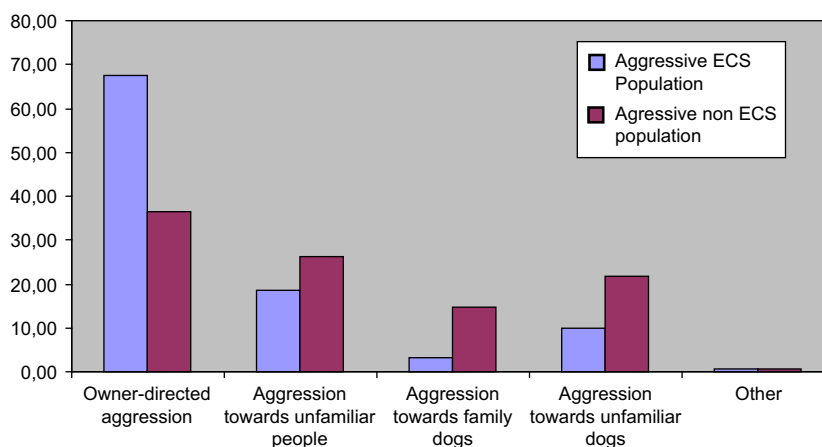


Figure 1 Owners' complaints. Aggressive ECS population was significantly more likely to show owner directed aggression than aggressive non-ECS population whereas aggressive non-ECS group was significantly more likely to show aggression problems toward unfamiliar people, family dogs, and unfamiliar dogs than aggressive ECSs.

displayed. On average, each dog displayed aggression in 3 contexts. No statistical associations were found between contexts.

The body language of ECSs showing owner-directed aggression was analyzed in the 98 cases where the owner was able to report that information. Fifty-six percent ($n = 55$) of owners reported 1 or more ambivalent signals during aggressive episodes. The authors considered an ambivalence posture when the owner described the presence at the same time of offensive and defensive signs (Beaver, 1999). In 44% ($n = 43$) of cases, the dog's body posture was considered mainly offensive, since no elements of ambivalence were noticeable to the owner. These results were not significantly different from those observed in other breeds.

According to the owner's description of the sequence of the attack, 3 groups of dogs were identified. Dogs that always reacted with impulsiveness (6%), those that never showed impulsiveness (57%) and those with both forms of

aggression (37%) were reported. In comparing both groups of aggressive dogs, ECSs were found to show impulsive attacks more frequently than aggressive dogs of other breeds (43.7% vs 30.9%; $\chi^2 = 4.92$; $p < 0.03$). No relationship was found between coat color and impulsivity or between sex and impulsivity.

Discussion

ECSs were found to have a higher percentage of owner-directed aggression and a higher rate of impulsiveness than the aggressive non-ECS population.

A high proportion of a particular breed in the caseload of a referral service could result from a combination of 3 different factors: a higher presence of that breed in the overall canine population; a difference in owner reaction to a problem depending on the breed of the dog; and genuine breed differences, including genetic and environmental

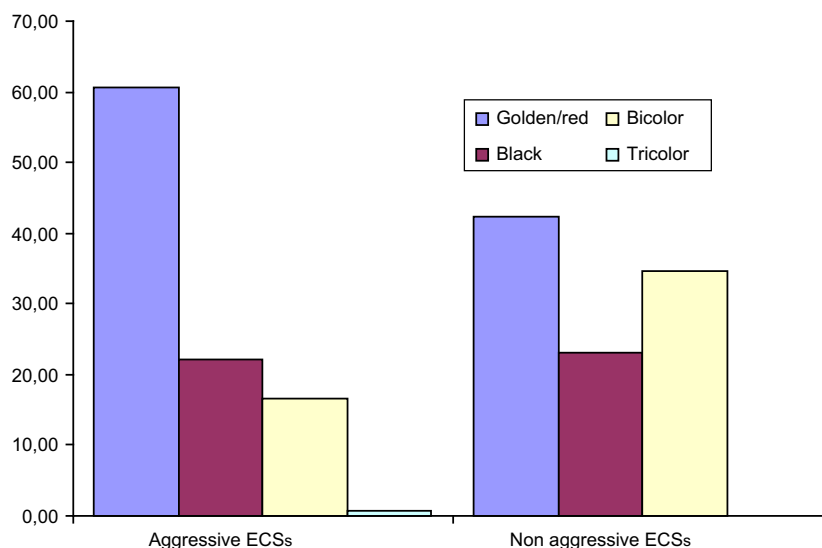


Figure 2 Distribution of coat colors for the two populations of cockers. In the ECS population, golden/red color was more common in the aggressive group than in non aggressive group.

factors that play a role in the expression of aggressive behavior, particularly toward family members.

The percentage of one particular breed should be corrected in relation to its presence in the overall canine population (Overall and Love, 2001). Further, the proportion of dogs of a particular breed may change over time, both in the referral database and in the general population (Bamberger and Houpt, 2006). According to the REIAC (Spanish Network for Dog Identification), the proportion of ECSs in the overall canine population in this geographic area has not substantially changed over the last 4 years. Therefore, according to this data, the high proportion of aggressive ECSs found in the present study does not seem to be a consequence of a higher popularity of this breed in the general population.

The owner's perception of an aggression problem may be influenced by the dog's breed and the way aggression is expressed. Some owners may be particularly sensitive and reactive to a problem that has been popularly linked to ECSs, as it has been also suggested for aggression in the ECS in the United States (Overall, 1997b). Moreover, living with an aggressive dog, especially if it shows impulsiveness toward family members, may be particularly challenging and therefore poorly tolerated by many owners (Lund et al., 1996; Fatjó et al., 2007). In fact, impulsive aggression is one of the main risk factors for euthanasia of aggressive dogs (Reisner et al., 1994).

The study of genetic factors involved in the neurophysiology of aggression could help to understand breed differences in the expression of aggressive behavior. Differences in some genes involved in behavior may explain why some breeds are more prone to show aggression than others. Recent studies suggest the existence of polymorphisms between different breeds in genes involved in the control of neurotransmitters like dopamine and glutamate (Niimi et al., 1999; Ogata et al., 2006; Takeuchi et al., 2005).

Also, differences in the level of aggression have been identified within the same breed. For instance, differences have been reported in the aggressive behavior of ECSs depending on coat color (Podberscek and Serpell, 1996; Pérez-Guisado et al., 2006). In fact, coat color is one of the physical traits most commonly associated with genetic influences in aggressive behavior in the ECS (Houpt and Willis, 2001). According to the present data, the golden coat was observed more frequently in the aggressive than in the control group of ECSs. This finding is in accordance with previous data from a survey of ECS owners in the United Kingdom (Podberscek and Serpell, 1996). Breed differences in aggressive behavior linked to coat color have also been described in other breeds. A study comparing the population of Labrador retrievers presented for either aggression or medical problems to a veterinary teaching hospital concluded that the percentage of yellow Labrador retrievers was significantly higher in the aggressive group. Chocolate and black Labrador retrievers were seen at comparable rates in both populations of dogs (Houpt and Willis, 2001).

Several mechanisms have been proposed to explain the link between coat color and temperament traits. Melanin shares a common biochemical synthesis pathway with dopamine and other neurotransmitters involved in the control of aggressive behavior (Hemmer, 1990). Alternatively, the association could be owing to the existence of pleiotropic genes involved in the expression of both traits. Finally, some studies suggest the existence of genetic linkage, where 2 genes controlling different traits are very close to each other and therefore may be inherited together (Keeler, 1942; Belyaev et al., 1981; Cottle and Price, 1987; Hayssen, 1997).

Besides genetic factors, environmental aspects such as handling and owner personality seem to play an important role in the development of aggressive behavior (Dodman et al., 1996). A survey of owners of ECSs concluded that owners of dogs showing a high aggression profile were more likely to be tense, less emotionally stable, shy, and undisciplined than owners of less aggressive dogs. Besides the possible influence of the owner's personality on the behavior of the dog, these results could be alternatively understood in terms of the effects of an aggression problem on family members. Further, this correlation could reflect a link between some personality traits of the owners and their preference to adopt a particular breed (Podberseck and Serpell, 1997b).

A previous study also found a link between the experience of the owner and the prevalence of dominance-related aggression. The authors suggested that dogs belonging to first-time owners showed dominance-related aggression more frequently than dogs belonging to experienced owners, probably owing to less capable handling and a lack of knowledge of canine communication (Jagoe and Serpell, 1996). A more detailed analysis of the personality traits and handling methods of the owners may help to understand aggressive behavior in the ECS.

Regarding sex and neutering status, males were more frequently found in the group of aggressive ECS than females. Nevertheless, this finding does not reflect a breed-specific characteristic, since it is not significantly different from what was observed in the aggressive non-ECS population. In fact, there is abundant evidence of the influence of male sexual hormones in the expression of offensive aggression in a variety of species, including the dog (Wright, 1991; Lund et al., 1996; Manteca, 2003; Reisner et al., 2005).

Previous studies on canine aggression found a percentage ranging from 8% to 76% of dogs showing unpredictable attacks that may be an indication of a lack of impulse control (Podberscek and Serpell, 1996; Reisner et al., 1996). The estimated prevalence of impulsive aggression depends on whether one considers dogs always showing aggression without warning signals or dogs where impulsive attacks coexist with signaled forms of aggression. The percentage of dogs always reacting in an impulsive way in the present study (6%) is very close to that described by other authors (8%)

(Podberscek and Serpell, 1996). Alternatively, if dogs showing signaled as well as nonsignaled attacks are considered, the rate of impulsive aggression increases to 42%.

Compared with aggressive dogs of other breeds, ECSs showed impulsive attacks more frequently. There are several possibilities to explain this non-inhibited way to display aggression by ECS. Morphological changes resulting from domestication could make it difficult to distinguish some expressions of threat in some breeds (Fox, 1971; Goodwin et al., 1997). For instance, in the ECS the drooping ears and short tail may make it more difficult to understand the dog's body language (Beaver, 1999). Therefore, aggressive episodes in these dogs may be incorrectly perceived by the owner as being impulsive. Moreover, a recent study of the owner's ability to read and remember the dog's body language suggested that people fail to correctly report common signals of aggression (Correia et al., 2007).

According to some authors, impulsive aggression may be the result of the selective reinforcement of the biting phase within the aggressive sequence. Through this learning process, dogs may learn to suppress warning signals, since they are not useful in deterring the opponent (Pageat, 1998).

From a neurophysiological perspective, aggression—particularly impulsive aggression—has been linked to a central serotonergic dysfunction in humans, laboratory animals, and domestic dogs (Mehlman et al., 1994; Reisner et al., 1996; Kavoussi et al., 1997; Peremans et al., 2003; Van der Veegt et al., 2003). In dogs, Reisner et al. (1996) observed a correlation between cerebrospinal fluid monoamine metabolites and aggression toward the owner. They found lower levels of 5HTIAA in aggressive dogs, particularly in those not displaying warning signals prior to an attack. More recently, a study using single-photon emission tomography indicated differences in the activity of serotonin receptors in the brain of dogs showing impulsive attacks (Peremans et al., 2003).

Conclusions

According to these results, ECSs were presented to a referral practice more frequently for aggression than dogs of other breeds. Also, the aggression of ECSs was different from that of other breeds, with a higher rate of impulsive attacks in the ECS. The present study provides some quantitative data on the effect of breed differences on the occurrence of behavior problems, which could help to develop more effective preventive and treatment strategies.

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