

Separation anxiety syndrome in cats: 136 cases (1991–2000)

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Objective—To determine whether cats develop clinical signs typical of separation anxiety syndrome (SAS) and the type and frequency of applicable clinical signs in affected cats.

Design—Retrospective study.

Animals—136 cats with clinical signs typical of SAS in dogs. Subjects were evaluated during home visits.

Procedure—Medical records of pet cats evaluated for behavior problems during a 10-year period were reviewed. Medical records of cats that displayed behaviors typical of dogs with SAS (eg, inappropriate elimination, excessive vocalization, destructiveness, or self-mutilation) were more extensively examined, and cats that displayed these behaviors only when separated from an apparent attachment figure were included in the study.

Results—Behavior problems triggered by separation anxiety included inappropriate urination (96 cats), inappropriate defecation (48), excessive vocalization (16), destructiveness (12), and psychogenic grooming (8). Inappropriate defecation was identified in a significantly higher percentage of the neutered females in the study than in the neutered males. Seventy-five percent of the cats that urinated inappropriately urinated exclusively on the owner's bed. Psychogenic grooming was identified in 8 of the 40 neutered females but in none of the neutered males, whereas destructiveness was observed in 12 of the 92 neutered males but in none of the neutered females.

Conclusions and Clinical Relevance—Results suggest that cats can develop SAS. Sex and breed differences in the frequency of particular signs of SAS in cats may exist. Feline SAS should be considered in the differential diagnosis of anxiety-related misbehavior in cats. (*J Am Vet Med Assoc* 2002;220:1028–1033)

Separation anxiety is an emotional, behavioral, and physiologic set of responses triggered by separation from an attachment figure. The disorder is common among social species such as birds, dogs, horses, cetaceans, and primates (including humans).^{1,3} Dogs with separation anxiety experience signs of distress when their preferred associate (eg, favorite person or

pet companion) is absent. The degree of distress is dependent on the dog's attachment to the preferred associate. Emotional responses in affected dogs are triggered by separation from a specific individual and are not attributable to social isolation alone. Dogs that are sent to board at kennels, hospitalized at veterinary clinics, abandoned by the roadside, surrendered to shelters or left alone at home, and dogs that go through the death or illness of a pack member all experience separation anxiety to various degrees.²

The social behavior of pet dogs reflects their descent from wolves, which have a highly structured society.^{4,5} Group cohesion and cooperation are essential to pack survival and species success. The emotional relationships between members of a pack are the glue that cements and solidifies the social structure. These psychosocial attachments also predispose pet dogs to experience separation-related emotions and behavior. The appearance of separation-related distress can be viewed as a defining criterion of sociability.^{2,3} Without social bonding, separation anxiety would not exist. Consequently, we do not expect to find signs of separation anxiety in asocial species.

Separation anxiety disorder occurs in people, primarily children, and is clearly distinguished from panic attack and other more intense emotional reactions.⁶ However, extreme emotional and behavioral reactions often characterize separation anxiety in other social species. Clinical signs triggered by separation anxiety in pet dogs, for example, encompass a variety of emotional, behavioral, and physiologic responses that vary both in intensity and in clinical appearance. The term separation anxiety, however, does not adequately convey the range and intensity of behaviors exhibited by severely affected pets. For example, some dogs exhibit signs of great agitation and emotionality on a daily basis when separated from their owners. Accordingly, **separation anxiety syndrome (SAS)** is a more appropriate term for this disorder in veterinary behavior medicine.³

Clinical signs of SAS in dogs are typically most intense within the first 15 minutes after separation from the preferred associate but may persist much longer or occur intermittently during periods of isolation.¹ There are 3 primary categories of clinical signs of SAS^{1,2}: inappropriate elimination (urination and defecation), vocalization, and destructiveness. Inappropriate urination and defecation in dogs with SAS may be intentional (eg, territorial marking to release anxiety) or an involuntary physiologic sign of extreme distress (eg, diarrhea or fear-induced urination). Excessive or persistent vocalization may be a signal of the dog's emotional discomfort or may be an attention-seeking distress call. Destructiveness may be a result of attempts to escape confinement (eg, from a crate or

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restricted space). Another less common sign of SAS is self-mutilation. Such injuries may be inflicted intentionally, as with psychogenic grooming or compulsive tail chewing, or may be accidental, resulting from attempts to escape from metal or fiberglass crates or through windows and doors.

Anxiety triggers a recognized set of physiologic phenomena that contribute to the cognitive experience of anxiety.⁷ Tachycardia, hyperventilation, trembling, and gastrointestinal tract upset are typical of nonspecific and separation-triggered anxiety, and in dogs with SAS, physical changes triggered by anxiety develop in anticipation of an owner's impending departure. The physical and behavioral signs of anxiety escalate and peak in the moments following actual separation, although they may persist in many dogs until the attachment figure returns.¹³ Indeed, many dogs show signs of anxiety when greeting the attachment figure following an absence. Thus, anxiety is seen in anticipation of the departure of attachment figures, during their absences, and in the period immediately following their return.

Cats have traditionally been viewed as asocial and have been considered, therefore, unlikely to develop SAS. However, this characterization of cats is inaccurate. Kittens, like puppies, have a critical period of socialization toward people and to each other,^{8,9} suggesting that sociability is a plastic phenomenon that is fundamental to both species. Similarly, vocal communication is a characteristic of social species,^{9,10} and cats emit a wider range of acoustic signals than do dogs. In addition, the complexity of nonvocal communication in cats (including postural, facial, and chemical signals)^{9,11,12} and the array of affiliative behaviors^{13,14} attest to the social nature of domestic cats. Thus, it seems likely that cats may be susceptible to SAS. The purpose of the study reported here was to determine whether cats actually develop SAS and the type and frequency of clinical signs in affected cats.

Criteria for Selection of Cases

Medical records of cats evaluated during home visits because of behavior problems between 1991 and 2000 were reviewed. Medical records of cats that displayed behaviors typical of dogs with SAS (eg, inappropriate elimination, excessive vocalization, destructiveness, or self-mutilation) were more extensively examined, and cats that displayed these behaviors only when separated from an apparent attachment figure were included in the study.

Procedures

Behavior history, results of a physical examination performed by the referring veterinarian or at the time of the behavior consultation, results of any clinicopathologic testing, and details of follow-up care were obtained from the medical records. Breed, sex, reproductive status (sexually intact vs neutered), and age were obtained from the medical records, along with behavior problems and social context of those problems. These tabulated data were compared and analyzed for significant differences between breed and sex groups and to determine whether sex was associated with age at the onset of clinical signs, whether sex was associated with each category of clinical signs, and

whether sex was associated with whether the cat was or was not a solitary pet.

Results

A total of 716 cats (412 neutered males, 288 neutered females, 12 sexually intact males, and 4 sexually intact females) were evaluated for behavior problems. Three hundred of these cats displayed nonspecific behaviors typical of dogs with SAS, including inappropriate elimination (212), excessive vocalization (40), destructiveness (36), and self-mutilation (12). Of these 300 cats, 136 displayed specific behaviors only when separated from a favorite person or housemate and were included in the study. These behaviors were displayed exclusively in the absence of the preferred attachment figure. For the 716 cats with behavior problems, neutered males with behavior problems were 1.6 times as likely ($P = 0.005$) to show signs of SAS as were female cats (neutered or sexually intact) with behavior problems.

Of the 136 cats included in the study, 102 (75%) lived exclusively indoors. There were 92 (68%) neutered males, 40 (29%) neutered females, and 4 (3%) sexually intact females. Eighty (59%) cats were domestic shorthairs, 24 (18%) were domestic longhairs, 16 (12%) were Persians, 8 (6%) were Siamese, 4 (3%) were Burmese, and 4 (3%) were Himalayans. Of the 80 domestic shorthair cats, 52 (65%) were neutered males, 24 (30%) were neutered females, and 4 (5%) were sexually intact females. All 24 of the domestic longhair cats were neutered males.

Of the 92 neutered male cats, 84 (91%) were between 1 and 7 years old, and 64 (70%) were between 1 and 5 years old. Of the 40 neutered female cats, 24 (60%) were < 5 years old, and 8 (20%) were > 11 years old (Fig 1). The proportion of female cats with SAS that were > 7 years old (12/44; 27%) was significantly ($P = 0.014$) higher than the proportion of male cats with SAS that were > 7 years old (0/92).

All 8 of the Burmese and Himalayan cats in the study were neutered males. Four of the Persian cats were neutered males, and 12 were neutered females; however, it could not be determined whether this predominance of neutered female Persians was attributable to a predisposition to SAS or to some other factor. Four of the Siamese cats were neutered males, and 4 were neutered females. All Persian females urinated as a display of separation-triggered anxiety. Persian males were equally likely to urinate and defecate. Siamese

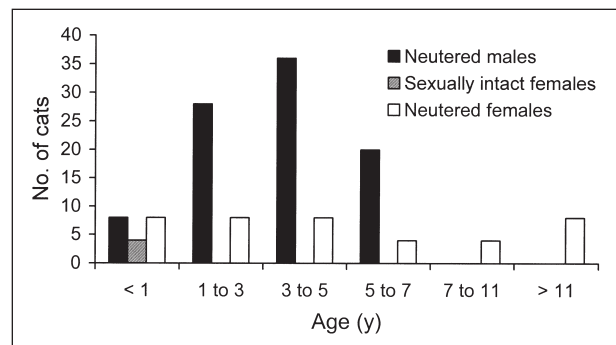


Figure 1—Age distribution of 136 pet cats with clinical signs typical of separation anxiety syndrome in dogs.

males were equally likely to urinate as to vocalize, and 4 (33%) of the 12 male cats with excessive vocalization were Siamese, accounting for 4 (25%) of all 16 excessively vocal cats. Siamese females, on the other hand, defecated as a display of separation-triggered anxiety. A predilection for a particular behavior triggered by separation anxiety was not identified in the Burmese and Himalayan cats. Although a significant difference in the distribution of neutered female purebred cats was detected (Fisher exact test; $P = 0.004$), conclusions about a sex predilection for SAS among purebred cats could not be made because of the small number of purebred cats in the study and the lack of an appropriate control population for comparison.

Of the 136 cats in the study, 70 (52%) were solitary pets. Solitary pet cats accounted for 32 of the 40 (80%) neutered females and 36 of the 92 (39%) neutered males. The proportion of solitary pet females (neutered and sexually intact) was significantly ($P < 0.001$) higher than the proportion of neutered males in the study that were solitary pets.

Behavior problems triggered by separation anxiety included inappropriate urination (96 cats), inappropriate defecation (48), excessive vocalization (16), destructiveness (12), and psychogenic grooming (8; Fig 2).

Inappropriate elimination was a problem in 212 of the 300 (71%) cats initially identified as displaying nonspecific behaviors typical of dogs with SAS. In 96 of these 212 (45%) cats, instigation and persistence of inappropriate elimination were clearly and directly associated with the absence of an attachment figure. Inappropriate elimination in the other 116 cats was attributed to underlying urinary tract infection or inflammation, a territorial conflict with a housemate, introduction of a new pet or new roommate, or delayed castration of adult male cats. Inappropriate elimination was 5 times as likely to occur ($P < 0.001$) in cats with SAS than in cats examined for other behavior problems.

Inappropriate defecation was identified in a significantly ($P = 0.023$) higher percentage of the neutered females in the study (24/40; 60%) than in the neutered males (24/92; 26%). On the other hand, the proportion of neutered females with inappropriate urination (28/40; 70%) was not significantly different from the proportion of neutered males with inappropriate urination (64/92; 70%). Seventeen of the 48 (35%) cats with inappropriate defecation also urinated inappropriately. The remaining 31 of the 48 (65%) cats with inappropriate defecation did not have inappropriate

urination. In 63 of the 96 (66%) cats with inappropriate urination, this was the only sign of SAS. Six of the 40 (15%) neutered females had inappropriate urination and inappropriate defecation, whereas 61 of the 92 (66%) neutered males only had inappropriate urination. Fifty-five of 96 (57%) cats that displayed inappropriate urination as a sign of SAS urinated on the owner's bed; among these 55 cats, 41 (75%) urinated exclusively on the owner's bed.

Psychogenic grooming was identified in 8 of the 40 (20%) neutered females but in none of the neutered males, whereas destructiveness was observed in 12 of the 92 (13%) neutered males but in none of the neutered females. Among cats with SAS, females were significantly ($P < 0.001$) more likely than males to engage in psychogenic grooming, whereas males were significantly ($P = 0.018$) more likely than females to be destructive.

Excessive vocalization was generally described as loud or persistent meows. Although the proportion (12/92; 13%) of male cats in the study that vocalized excessively was slightly higher than the proportion (4/40; 10%) of neutered female cats that did, sex was not significantly associated with whether cats vocalized excessively. However, the number of cats that vocalized excessively was small, making it difficult to detect significant differences.

Discussion

Despite cats' widespread reputation for an inability to develop close social alliances with conspecifics and individuals of other species, the true social nature of cats is becoming clarified. As in dogs, sociability in cats is both a product of experience and an innate mechanism that is plastic and finite.⁸⁻¹⁰ The complexity of acoustic behavior in cats suggests that social signaling over short and long distances is important in cats. In fact, cats have been accredited with more than a dozen types of vocalizations, which exceeds the vocal repertoire of dogs.^{10,11} Nonvocal communication among cats is both subtle and intricate. The tail may be held in numerous positions, each conveying an important social signal. The arch of the back, level of the head, degree of constriction of the pupil, and orientation of the ears and whiskers signal a dominance challenge, submission, impending attack, or fear.^{13,14} Preferred alliances, what we would call friendships, are common among domestic cats, as proven by their choice of partners for sleeping, resting, sitting, playing, sharing food, allogrooming, and allorubbing.¹⁴ Most pet cats engage in frequent social interactions with each other and with their owners. For example, pet cats commonly sleep with a family member and greet their owners at the door.¹⁵

Results of the present study suggest that cats can develop SAS, in that a population of cats was identified that had clinical signs typical of SAS in dogs that were associated with separation from a preferred associate. The most common sign of separation-triggered anxiety in these cats was inappropriate elimination. Inappropriate elimination in cats has been associated with a number of environmental, physical, and behavioral factors.¹⁵⁻¹⁷ Possible physical factors associated

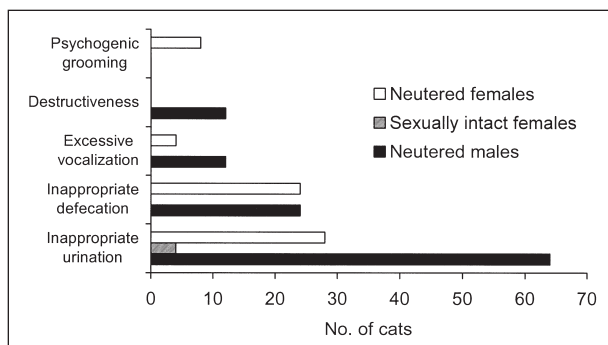


Figure 2—Clinical signs of separation anxiety syndrome in 136 cats.

with inappropriate elimination in cats include metabolic diseases such as diabetes mellitus, neurologic diseases, and diseases of the urinary or digestive tract^{15,17}; possible behavioral factors include litter box aversion, inaccessibility to the litter area, substrate preference, fear or anxiety, and territorial marking. A urinalysis was performed in all cats in the present study with inappropriate urination, and urinary tract disease was ruled out as a cause of inappropriate urination in these cats. In many cases, clinicopathologic test results were obtained by referring veterinarians prior to behavior evaluation or clinicopathologic testing was performed by the author when the history or results of a physical examination performed at the time of the behavior consultation were questionable. An in-depth behavior history, along with results of physical examination and clinicopathologic testing, contribute to the diagnosis of SAS in both cats and dogs.

The finding that 41 of the 55 (75%) cats in the present study with separation-triggered inappropriate urination marked exclusively on their owners' beds is intriguing. Urine marking of this particular target may be a species-specific separation reaction, and SAS should be included in the differential diagnosis for cats that urinate on beds. However, cats that urinate on their owners' beds could have clinical or subclinical urinary tract disease in the absence of separation-related anxiety. Thus, urinalyses and appropriate biochemical analyses should be performed to exclude the possibility of underlying diseases in cats examined because of inappropriate elimination. It has been suggested that cats may void on their owners' beds because of a substrate preference for a soft absorbent surface.^{15,16} However, it seems more likely that cats can distinguish between areas used for sleeping, particularly areas that they often share with their owners, and areas used as a latrine. In addition, in the author's experience, cats may void on beds when their owners are at home, and some cats may urinate (squatting or spraying) directly on their owners in bed. Territorial marking and scent layering must play a role in this behavior; however, it may also reflect a pattern that was precipitated by a specific separation-related anxiety-releasing mechanism. Certainly, not every act of feline elimination on a bed is triggered by separation-anxiety; however, the findings in this study point to a possible trend among pet cats separated from their owners.

Frustration because of unaccustomed confinement may overlap with separation anxiety to various degrees in outdoor cats confined during their owners' absence. Outdoor cats that are confined indoors during their owners' absence may appear agitated and attempt to escape, but it is unknown how much of their anxiety might be attributable to frustration (barrier anxiety, claustrophobia) versus separation from their owners. In addition, house soiling among outdoor cats that are confined indoors may be attributable to a preference for an outdoor latrine or a substrate found outdoors. However, only 14 of the cats in the present study were outdoor cats, and all but 4 of these cats continued to roam outdoors during owner absences, either under the care of a pet sitter or neighbor or because the owners had installed a pet door through which the cat

could exit or enter the home at will. Thus, most of the outdoor cats in this study continued to have access to the outdoors, and behavior problems were clearly associated with separation from their owners. Unfortunately, the small number of outdoor cats in this study did not permit any conclusions regarding differences between indoor and outdoor cats.

The high proportion of solitary neutered female cats in the present study suggests that they may have a higher risk of developing SAS, compared with solitary males. Female cats are known to exhibit more affiliative behaviors than do males,¹² which may predispose them to anxiety when social opportunities are limited. Females may be more inclined to bond with other females to form communal nests. Males, on the other hand, tend to roam between female groups to pursue mating opportunities. In addition, male cats have been recognized to be more assertive in general. For example, male kittens play more roughly and are more object-oriented. They patrol larger territories than do females. Males, therefore, may be more self-reliant in situations of limited social interaction. The sex difference in affiliative behaviors of cats has been attributed to sexually dimorphic reproductive strategies,¹² and the sex difference in risk of SAS may be linked to the same phenomenon.

Psychogenic grooming was more characteristic of female cats with SAS in the present study, whereas destructiveness was more typical of male cats. Possible behavioral causes of destructiveness include territorial marking (eg, scratching undesirable surfaces), accidental destruction during play or territorial investigation, and attention-seeking behavior. Possible behavioral causes for excessive grooming include allergy, external or internal parasitism, autoimmune disease, and compulsive or stereotypic behavior. Stereotypic motor activity has been observed in a dog¹⁸ disturbed by separation from its owners. A Siamese cat with obsessive-compulsive pacing that was alleviated by ovariohysterectomy exhibited an increase in motor stereotypy as the owner prepared to leave for work.¹⁹

The significant associations between sex (male vs female) and destructiveness and between sex and psychogenic grooming in the present study deserve further investigation. These findings may imply that males are more inclined toward extroverted active signs of SAS, whereas females are more inclined to introverted passive signs. Alternatively, psychogenic grooming might represent a more intense form of social stress or anxiety, compared with destructiveness.

Excessive vocalizations (described as meows of varying intensity and volume) associated with owner departure were heard just prior to or during the initial moments of the departure of an attachment figure. These vocalizations were described by owners or other persons who remained behind with the cat. When witnesses were present, the cats were often reported to be agitated as well as vocal. Presumably, these were attention-seeking or distress calls (etepimeletic vocalizations) and would be consistent with a need for continuity in social interaction.^{12,13} Vocal communication is advantageous in remote signaling.

The finding that 8 of 40 (20%) neutered female

cats in the present study were > 11 years old suggests that females may be more sensitive to separation over a lifetime. Alternatively, the higher proportion of female cats with SAS that were older could be attributable to an underlying difference in the psychobiology of aging cats, a sex-based predisposition, or a tendency by owners to more frequently have older female cats than older male cats examined for behavior problems. Nevertheless, this finding does suggest that it is important to consider the age of cats examined because of behavioral problems. Underlying medical conditions are not unknown in older pets with behavioral disturbances, including separation-related signs.^{20,21} Thus, a thorough physical evaluation, including laboratory analysis of blood and urine, should be an important part of the diagnostic work-up of cats with signs of SAS.

Cats in which the only signs of separation anxiety were vocalization, destructiveness, or psychogenic grooming might be underrepresented in the present study. Such behaviors may not be as intolerable to many pet owners, compared with inappropriate elimination. Thus, cats in which these are the only signs may not be as likely to be brought to a veterinarian for examination or referred to a veterinary behaviorist.

Cats with grooming disorders are commonly examined by general veterinary practitioners. Most often, 1 of the many skin diseases that affect cats will be diagnosed and appropriate treatment will be instituted. However, at least some of these cats may have been initially triggered to groom excessively as a response to separation from an attachment figure. Unless the exact onset or context of this behavior is discussed in the course of a routine examination, the underlying emotional trigger may not be recognized. Clinical appearances of various skin disorders with different causes may closely resemble each other. Cats with dermatologic disorders attributable to an unidentified psychogenic alopecia may respond, at least temporarily, to nonspecific treatment and consequently many may not be referred to veterinary behaviorists. Thus, excessive grooming as a sign of SAS in cats may well be underreported.

The finding that only 52% of the cats in the present study were solitary pets suggests that the company of other pets does not preclude the emergence of separation anxiety. This is consistent with SAS in dogs, as dogs with SAS may be solitary pets or from multidog households. The critical attachment that is being tested is between the affected animal and the departed individual.

A relatively infrequent sign of SAS in dogs is aggressiveness.¹ Dogs with anticipatory anxiety may learn to disrupt their owners' departure routine by nipping or biting at them as they prepare to depart or approach the door. Instrumental aggression, whereby cats learn to behave aggressively to effect a desired outcome, is recognized; however, aggressive cats were not considered for inclusion in the present study. It is quite possible that aggressiveness will be revealed in future research on SAS in cats.

Persians were the most common purebred cats in the present study; however, two thirds of the purebred cats evaluated for behavior problems during the study

period were Siamese. Thus, the predominance of Persians in this study was likely not simply a result of sample frequency. Persian cats are popularly characterized as reserved, compared with Siamese cats, and the predominance of Persian cats in the present study may lend additional support for an association between internalized or passive emotionality and overt signs of SAS. Siamese males in the present study were as likely to urinate inappropriately as to vocalize, but Siamese females did not vocalize excessively, contradicting popular impressions of this breed's characteristics. Thus, the tendency of many cat fanciers, veterinarians, and breeders to stereotype breed temperament and behavior is inadvisable without further data.

One hundred thirty-two of the 136 (97%) cats in this study were neutered. This may be a reflection of the pet population from which the sample was drawn, making it unclear whether neutered cats might be more prone to SAS. In a recent study²² of risk factors for SAS in dogs, 91% of the dogs were neutered, and compared with sexually intact dogs, neutered dogs were 3 times as likely to have difficulty with the absence of an attachment figure. Mixed-breed dogs were slightly more predisposed toward separation-triggered behavior problems, compared with purebred dogs, but this difference was not statistically significant. Most cats in the present study were domestic shorthairs or domestic longhairs; however, this may also reflect the population from which the sample was drawn.

Treatment of SAS in dogs¹⁻³ includes management of the clinical signs in individual patients, as well as an increase in the number and duration of quality interactions with the owner, and treatment of SAS in cats would likely be similar. Social interactions should include activities that are enjoyed by the individual cat, such as interactive play with toys, introduction of novel toys and games, petting, and grooming. Environmental manipulation to control marking behavior may also be necessary to discourage repetitive marking of preferred target surfaces²³ and could include the use of citrus-scented substances, double-sided adhesive tape, or confinement.^{15,16}

Although therapeutic reliance on medication alone is ill advised, use of psychoactive medication may be necessary in dogs with SAS in which behavior modification alone is unsuccessful in alleviating clinical signs, and the same may be true in cats. Because anxiety is the underlying feature of SAS, control of anxiety should be the focus of treatment. Medications that interfere with the physiologic stress response may reduce the perception of fear and anxiety and, thus, may be the most useful in alleviating clinical signs.

Benzodiazepines (eg, diazepam, alprazolam, and triazolam) are perhaps best known for their anxiolytic effect in pets and have the added advantage of rapid onset, compared with other psychoactive medications. Although diazepam has been associated with sporadic cases of fulminant hepatic necrosis in cats,²⁴ this does not preclude the use of benzodiazepines. Amitriptyline is of value for treatment of various anxiety-related behavior problems²⁵ and should be beneficial in cats with SAS, particularly those with inappropriate urination. Clomipramine has been used to treat dogs with

SAS and, thus, may be of benefit in cats. Similarly, cyproheptadine has shown promising results for treatment of inappropriate elimination in cats and may have a mood-stabilizing effect as well.^{26,27} Buspirone has been advocated for treatment of anxiety-related disturbances in cats²⁸ but has not proven effective in this author's experience. Fluoxetine may also help to stabilize mood and alleviate the emotional upheaval that typifies SAS; however, drugs such as amitriptyline are more cost effective. These drugs are not approved for use in cats, and clients should be informed that such usage is extralabel. In addition, routine precautions such as performing hematologic and serum biochemical analyses before and periodically during treatment with psychoactive medications should be taken. In general, drugs should not be administered without concomitant behavior modification, and psychopharmacologic intervention should be reserved for more severe cases of SAS. This is the first report of a clinical investigation of SAS in cats.

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