Use of clomipramine, alprazolam, and behavior modification for treatment of storm phobia in dogs

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Objective—To evaluate use of clomipramine, alprazolam, and behavior modification for treatment of storm phobia in dogs.

Design—Prospective open clinical trial.

Animals—40 dogs with storm phobia.

Procedure—Dogs received clomipramine at a dosage of 2 mg/kg (0.9 mg/lb), PO, every 12 hours for 3 months; then 1 mg/kg (0.45 mg/lb), PO, every 12 hours for 2 weeks; then 0.5 mg/kg (0.23 mg/lb), PO, every 12 hours for 2 weeks. Alprazolam was given at a dosage of 0.02 mg/kg (0.009 mg/lb), PO, as needed 1 hour before anticipated storms and every 4 hours as needed. Desensitization and counter-conditioning were conducted at home by the caregiver with an audio simulation of storm sounds that had induced a fear response during evaluation.

Results—30 of the 32 dogs that completed the study had a degree of improvement, as measured by caregivers' global assessment. Two caregivers considered the storm phobia to be resolved. Panting, pacing, trembling, remaining near the caregiver, hiding, excessive salivation, destructiveness, excessive vocalization, self-trauma, and inappropriate elimination all decreased significantly during treatment. Improvement was greater during true storms (rain, thunder, and lightning) than during rain only. Response to audio simulation did not change during treatment. Four months after the study, improvement was maintained.

Conclusions and Clinical Relevance—The combination of clomipramine, alprazolam, and behavior modification can be effective in decreasing or eliminating storm phobia. Improvement could not be evaluated by use of audio simulation of a storm. (*J Am Vet Med Assoc* 2003; 222:744–748)

S torm phobia is defined as behavior indicative of fear in response to storms and storm-related phenomena when they occur in isolation (eg, rain, dark clouds in sky, and wind). The term thunderphobia[1] is misleading because it indicates that thunder is the cause of fear. However, fear of other storm-related phenomena such as changes in barometric pressure or the sound of wind, with or without thunder, is common.[2] It is a serious problem both from an animal welfare perspective and because of destruction of property. Dogs with storm phobia have intense fear, as evidenced by trembling and crying. Some dogs injure themselves when their fear escalates to panic and they break through screened or glass doors or windows. Property is also damaged, as dogs bite and claw at carpets, door and window frames, and other items. Treatment of storm phobia has historically included behavior modification: specifically, **desensitization and counter-conditioning (DSCC)**, medication, or a combination of both.[1,2,3] However, specific reports assessing improvement in a quantitative manner are lacking.

Storm phobia is not an all-or-none phenomenon and increases with increasing intensity of the storm. A certain degree of fear when exposed to a tornado, hurricane, or severe thunderstorm is probably a normal behavioral and physiologic response, while intense fear in response to a change in barometric pressure is not. The latter may be a classically conditioned response to a change in barometric pressure that was predictive of subsequent storms, which may have been severe. Total resolution of storm phobia, that is, a dog that is totally calm in the midst of severe weather conditions, is probably not a realistic goal. For a dog with storm phobia, a realistic goal may be to increase tolerance to intense storms that induce a fear response and decrease the number and intensity of behaviors indicative of fear.

Our goal was to induce substantial improvement or resolution of storm phobia through an aggressive treatment plan. Behavior modification was included in an attempt to induce learning of a new response to storm sounds. Clomipramine, a tricyclic antidepressant with anxiolytic properties, is administered 1 or 2 times daily and induces a condition of continuous control of anxiety in many dogs.[2,4]

Alprazolam is a rapid-acting benzodiazepine with strong anxiolytic and antipanic properties.[2] It is used as a supplement to clomipramine during storms, because clomipramine alone may not be sufficient protection against the intense fear induced by a severe storm. The purpose of the study reported here was to evaluate use of clomipramine, alprazolam, and behavior modification for treatment of storm phobia in dogs.

Materials and Methods

This study was approved by the College of Veterinary Medicine Hospital Board at the University of Georgia. Client consent was obtained. Dogs were recruited via advertisements placed in facilities where caregivers of dogs with storm phobia were likely to encounter them, such as veterinary hospitals and pet stores. In addition, letters were sent to area

veterinarians informing them of the study. Veterinary referral was required for dogs to be included in the study. Caregivers were initially interviewed via telephone. Dogs were included if they had a fear response to at least 3 recent storms, including behaviors such as trembling, pacing, panting, excessive salivation or vocalization, inappropriate elimination, destructiveness, self-trauma, and staying near the caregiver. Selected dogs weighed 5 to 45 kg (11 to 99 lb), were 1 to 12 years of age, and were in good health. Dogs with a history of aggression were excluded. Dogs that met these criteria were scheduled for evaluation.

During the initial evaluation, medical records of the past 12 months submitted by the referring veterinarian were reviewed, a complete behavioral history was obtained, and a physical examination was conducted. Specimens of blood and urine were obtained for urinalysis, serum biochemical analyses, and CBC. Serum urea nitrogen, creatinine, total protein, albumin, glucose, sodium, potassium, chloride, bicarbonate, calcium, phosphorus, magnesium, cholesterol, and total bilirubin concentrations were determined as well as anion gap and activities of alkaline phosphatase and alanine transaminase. For urinalysis, color, turbidity, specific gravity, pH, protein, glucose, ketones, bilirubin, RBCs, WBCs, epithelial cells, and crystals were evaluated. The dogs' responses to 3 different sound recordings of rain and thunderstorms were videotaped. The 3 recordings were of successively more intense storms, such that the first recording[a] had only rain sounds, the second[b] had rain and thunder, and the third[c] had multiple, intense sounds of thunder. Caregivers filled out a Likert scale questionnaire, the **storm phobia assessment** (**SPA**),[d] which included questions regarding the presence and intensity of behaviors during storms, including destructiveness, inappropriate elimination, excessive salivation, excessive vocalization, hiding, pacing, panting, remaining near the caregiver, self-trauma, and trembling. Values on this scale ranged from 0 (behavior never observed) to 5 (behavior frequent and severe) for individual behaviors and 0 to 50 for the total score of all behaviors. Caregivers were also given a diary[e] to record the weather and dogs' responses to the weather for approximately 2 weeks.

Dogs were included in the study if storm phobia was confirmed by the behavioral history, the caregiver's diary, and the dogs' response to the storm sound recordings; the physical examination and laboratory testing verified that the dog was in good health; and results of the behavioral examination confirmed that older dogs' cognitive functions appeared normal.

At a second evaluation approximately 2 weeks later, caregivers were instructed in the treatment protocol and given their dogs' medications and various diaries for record-keeping. Caregivers were given the least intense storm recording that had induced a fear response and instructions for DSCC. One or more counter-conditioners that were expected to be suitable for the dog, such as a toy or a particular food treat, were identified. Caregivers were instructed to attempt at least 1 session daily. They were to play the recording at a volume that did not induce a fear response, and give the dog its' favorite treats, pet it, and play with it so long as it remained calm. Increases in volume were to be made gradually. If the dog reacted with even mild indicators of fear when an increase in volume occurred, the caregiver was to withhold the counter-conditioner for 1 to 2 minutes. If the dog recovered and became focused on the caregiver, the toy, or the treat, they were to resume the counter-conditioning process. If the dog remained even mildly fearful, the caregiver was to lower the volume to a level at which the dog did not have fear.

In addition, caregivers were instructed to neither discipline nor console dogs if they had fear during storms. As much as possible, they were to ignore the dog during the storm. This was included in the protocol because certain dogs have fear behaviors when the caregiver is present during the playing of storm sounds, yet are completely calm if the same sounds are played when the caregiver is absent from the room. Historical operant conditioning, in the form of petting and talking soothingly to the dog when it is whining or pawing the caregiver, may reinforce behaviors when the dog is not actually afraid.

Dogs were also treated with clomipramine[f] at a dosage of 2 mg/kg (0.9 mg/lb), PO, every 12 hours for 90 days. If no improvement was detected at 30 to 60 days, the dosage was increased to 3 mg/kg (1.4 mg/lb). If unacceptable adverse effects developed that were not severe enough to require discontinuing the medication, the dosage was decreased to 1 mg/kg (0.45 mg/lb), PO, every 12 hours. After 90 days of treatment, the dosage of clomipramine was decreased by half (typically 1 mg/kg) for 2 weeks. The dose was halved again for a final 2 weeks (typically 0.5 mg/kg [0.23 mg/lb]) or until the dog completed the study. Alprazolam[g] was to be administered at 0.02 mg/kg (0.009 mg/lb), PO, 1 hour prior to anticipated storms. Administration was repeated every 4 hours, up to 4 times daily during storms.

Treatment diaries[h] included a daily log of weather conditions and medication administration, DSCC treatment sessions, and specific descriptions of storms and the dogs' reactions to storms.

At 30, 60, 90, and 120 days after the beginning of treatment, caregivers were interviewed and completed the SPA scale again. Caregivers were not given any information about their previous answers to these questions, and they completed the global assessment questionnaire.[i] Caregivers reported whether they believed their dogs' fear response to storms was worse, unchanged, somewhat better, substantially better but not resolved, or resolved in the previous 30 days. Values for global assessment scores ranged from 1 (worse) to 5 (resolved). Caregivers also reported whether their dog had any vomiting or other adverse events in the previous 30 days.

In addition, at 120 days, caregivers were asked to compare their dog's behavior with that at the beginning of the study. Dogs were again videotaped as in the initial evaluation. Physical examinations, urinalyses, CBC, and serum biochemical analyses were repeated at 120 days. Videotapes were analyzed with a video analysis system[j] by an observer (VP) who was not aware whether the tapes being scored were recorded before or after treatment. Behaviors scored as events were yawning and lip licking. Behaviors scored as states were whining, hiding, panting, and trembling.

An exit interview was conducted with open-ended questions in which owners were free to express views about their dogs' responses to treatment that may not have been addressed by the diaries or structured questionnaires.

Statistical analyses—Pretreatment and posttreatment values for tests run on urine and blood were compared by use of paired t-tests. A Bonferroni correction for running large numbers of tests required $P < 0.001$ for significance. For behavior observed on videotape, pre- and posttreatment results for the summed states, the summed events, and the individual behaviors were compared with t-tests. No attempt was made to balance distribution of males and females in the study. A χ^2 goodness-of-fit test was conducted to determine whether males or females were disproportionately represented in the study population. Friedman ANOVA was used to determine whether total SPA and caregiver global assessment scores changed over the duration of the study. If total SPA scores changed significantly, scores for specific behaviors were tested with a Friedman ANOVA. Caregiver global assessments measured general impressions of their dog's improvement. That general impression was also modified by the caregivers' expectations. Therefore, the Kendall rank correlation coefficient

Table 1—Mean ± SD storm phobia assessment (SPA) scores and percentage of improvement (120-day values vs baseline [before treatment] values) for 32 dogs with storm phobia

Signs of fear	Baseline*	30 days	60 days	90 days	120 days	% Improvement
Panting	4.2 ± 1.4	2.9 ± 2.0	2.8 ± 1.6	3.1 ± 0.4	2.3 ± 1.5	45
Pacing	3.9 ± 1.6	2.8 ± 1.8	2.1 ± 1.7	2.1 ± 1.7	1.8 ± 1.7	54
Trembling	3.7 ± 1.6	2.2 ± 1.6	1.7 ± 1.6	1.3 ± 1.7	1.0 ± 1.4	73
Remain by caregiver	3.2 ± 1.8	2.7 ± 2.0	2.8 ± 1.8	3.1 ± 2.0	2.4 ± 1.7	25
Hiding	3.3 ± 2.1	2.0 ± 1.9	1.9 ± 1.8	1.5 ± 1.5	1.7 ± 1.6	47
Excess salivation	2.5 ± 1.9	1.7 ± 1.5	1.7 ± 1.7	1.0 ± 1.1	1.6 ± 1.5	36
Destructiveness	2.5 ± 2.2	0.9 ± 1.6	1.1 ± 1.9	0.5 ± 1.3	0.8 ± 1.4	68
Excess vocalization	2.0 ± 2.1	1.2 ± 1.6	1.1 ± 1.5	0.5 ± 1.1	1.1 ± 1.6	45
Self-trauma	0.8 ± 1.6	0.09 ± 0.4	0.4 ± 1.0	0.2 ± 0.8	0.3 ± 1.0	63
Elimination	0.5 ± 1.1	0.2 ± 0.9	0.03 ± 0.18	0.03 ± 0.187	0.0 ± 0.0	100
Total score	26.6 ± 8.5	16.7 ± 7.0	15.7 ± 7.2	13.3 ± 5.0	12.9 ± 7.3	52

*Determined during the 14 days before treatment was initiated with clomipramine, alprazolam, and behavior modification, after which dogs were evaluated at 30-day intervals.

(τ) was used to determine whether scores of the caregivers' global assessments of improvement at 120 days were associated with the percentage of change in total SPA score. Baseline SPA scores were compared with SPA scores obtained 4 months after dogs had discontinued treatment by use of a Wilcoxon matched-pairs signed rank test. For all comparisons, values of $P \leq 0.05$ were considered significant.

Results

Continuance in the study—Thirty-two dogs completed the entire 120 days of treatment. Two dogs were withdrawn between the onset of treatment and 30 days; 1 caregiver did not like the way the dog responded to medication but did not specify what the problem was, and the other could not be contacted. By 60 days, 3 more dogs had been removed from the study; 1 dog had surgery unrelated to the study, and the caregiver discontinued medication, 1 caregiver could not continue in the study due to personal problems, and another could not be contacted. One dog was withdrawn by 90 days because the caregiver could not be contacted. By 120 days, 2 more dogs had been withdrawn; 1 caregiver could not be contacted, and the other went out of town for several days and the pet-sitter did not continue medications. We assumed that the owners who could not be contacted decided to withdraw from the study, perhaps because of the necessity of medicating their dogs, monitoring the weather, carrying out DSCC, and keeping substantial diaries.

Weather events—Twenty-nine of the 32 caregivers whose dogs completed the study kept good records of weather events, whereas 3 sets of records were discarded because of incompleteness. There were 936 recorded weather events during the 120-day period of treatment for these 29 dogs, with a mean of 32.3 events/dog (8 events/mo/dog). These events were distributed as follows, in order of incidence: rain only (n = 330 [35%]); rain, lightning, and thunder (231 [25%]); rain and thunder (156 [17%]); rain, strong wind, thunder, and lightning (113 [12%]); rain and strong wind (34 [4%]); thunder only (23 [3%]); rain, strong wind, and thunder (22 [2%]). Thunder and lightning only, rain and sleet, strong winds only, and snow accounted for the remaining 2%. In instances in which caregivers

Table 2—Prevalence of specific signs of fear among 32 dogs with storm phobia before treatment (baseline) and after 120 days of treatment

Signs of fear	Baseline No. of dogs (%)	Treatment No. of dogs (%)
Panting	30 (94)	28 (88)
Pacing	29 (86)	23 (72)
Trembling	28 (88)	15 (47)
Remain by caregiver	28 (88)	25 (78)
Hiding	26 (81)	21 (66)
Excess salivation	25 (78)	24 (75)
Destructiveness	20 (62)	9 (28)
Excess vocalization	19 (59)	14 (43)
Self-trauma	11 (34)	4 (13)
Elimination	9 (28)	0 (0)

reported thunder but not lightning, it is probable that lightning was so distant that it was not visible.

Dogs—Sex distribution of the 40 dogs that began the study was 1 sexually intact male, 16 neutered males, 1 sexually intact female, and 22 neutered females. There was no significant difference between the number of males and females. Twenty-two dogs had been strays, either directly acquired by the caregiver or adopted from an animal shelter. Six had been obtained from a breeder, and 12 were from private sources, such as a small breeder or a friend. Mean ± SD body weight was 23.5 ± 9.2 kg (range, 7.5 to 43.8 kg). Mean ± SD age was 5.9 ± 2.7 years (range, 1.5 to 12.0 years). Seventeen dogs had been acquired by their current caregivers prior to 3 months of age. Age of onset of storm phobia for those dogs was < 3 months (n = 3), 3 to 6 months (0), > 6 to 12 months (5), > 1 to 2 years (2), > 2 to 3 years (0), > 3 to 4 years (4), > 4 to 5 years (1), and > 6 to 7 years (2).

Storm phobia assessment—Analyses of SPA scores were conducted on the 32 dogs that completed the study. Total SPA score decreased significantly ($P < 0.001$) across 0, 30, 60, 90, and 120 days. Scores for all behaviors (**Table 1**) decreased significantly (self-trauma, $P = 0.001$; remain near caregiver, $P = 0.015$; all other behaviors, $P < 0.001$) over time. Total SPA scores decreased 52% during 120 days of treatment.

The number of dogs that had specific signs to any degree at initial evaluation and at 120 days was determined (**Table 2**). In all instances, fewer dogs had each specific sign at 120 days than at initial evaluation. Inappropriate elimination was the only behavior that

had ceased completely in all dogs that had that sign at initial evaluation.

Caregiver global assessment—Of the 38 dogs that remained in the study until 30 days, caregivers rated their storm phobia as worse (n = 1 [3%]), unchanged (12 [32%]), somewhat better (18 [47%]), or substantially better but not resolved (7 [18%]). At this time, 66% of dogs had some degree of improvement. At 120 days, caregivers rated their dogs' storm phobia as worse (n = 0), unchanged (2 [6.3%]), somewhat better (16 [50%]), substantially better but not resolved (12 [37.5%]), or resolved (2 [6.3%]). Thus, by the end of the study, 93.8% of the 32 dogs that completed the study had improved.

Caregiver global assessments for successive 30-day periods (0 to 30, 31 to 60, 61 to 90, and 90 to 120 days) were compared (P = 0.006). Thus, there were differences among 30-day periods in the caregivers' perception of the dogs' improvement. Specifically, mean scores for global improvement in each 30-day period increased with each successive period. Mean ± SD scores were 2.8 ± 0.7 for 0 to 30 days, 2.9 ± 0.8 for 31 to 60 days, 3.2 ± 0.6 for 61 to 90 days, and 3.3 ± 0.8 for 91 to 120 days. Thus, for the first two 30-day periods, typical caregiver perception was that improvement was somewhat better than during the previous 30 days, while for the final two 30-day periods, typical caregiver perception was that improvement approached substantially better but not resolved.

There was a significant (P = 0.01) correlation between the caregivers' global assessment and the per-centage of change in SPA score. The owner global assessments at 120 days included unchanged (n = 2; mean ± SD decrease in SPA score, 33.0 ± 30%), somewhat better (16; decrease in SPA score, 30.3 ± 27.8%), substantially better but not resolved (12; decrease in SPA score, 64.5 ± 19.6%), and resolved (2; decrease in SPA score, 93.0 ± 9.8%).

Videotapes—Although all dogs had anxiety while the sound recordings were played during clinical evaluation, many caregivers commented that the intensity of their dogs' behavior was far less than at home during an actual storm. There was no significant difference between pre- and posttreatment behavior in any of the videotaped behaviors.

Diaries—There were 711 complete and unambiguous diary entries from weather events that included rain or more severe weather that occurred when the caregiver was home and could fully observe the dog during the event. Rain was one of the mildest weather events frequently experienced by the dogs (**Table 3**), whereas weather events that included rain, thunder, and lightning were considered severe (**Table 4**). Although the dogs were much less likely to have fear during rain only, this behavior was observed occasionally. Decreases in signs of fear were most pronounced during severe weather.

Medical events—Medical events reported after the first 30 days (n = 38 dogs) were considered the most important for identifying consistent problems with spe-

Table 3—Prevalence of signs of fear and percentage change (120-day values vs baseline values) during rain in 29 dogs with storm phobia before treatment and during 120 days of treatment

Signs of fear	Baseline No. of events with sign (%) (24 events)*	Days 0–60 No. of events with sign (%) (110 events)*	Days 61–120 No. of events with sign (%) (94 events)*	% Change
Panting	6 (25)	25 (23)	13 (14)	−11
Pacing	4 (16)	26 (24)	13 (14)	−2
Trembling	8 (33)	8 (7)	4 (4)	−29
Remain by caregiver	8 (33)	22 (20)	22 (23)	−10
Hiding	6 (25)	14 (13)	14 (15)	−10
Excess salivation	5 (21)	8 (7)	11 (12)	−9
Destructiveness	3 (13)	6 (5)	8 (9)	−4
Excess vocalization	1 (4)	8 (7)	8 (9)	+5
Self-trauma	1 (4)	0 (0)	0 (0)	−4
Elimination	0 (0)	0 (0)	0 (0)	0

*No. of storms with rain only.

Table 4—Prevalence of signs of fear and percentage change (120-day values vs baseline values) during rain with lightning and thunder in 29 dogs with storm phobia

Signs of fear	Baseline No. of events with sign (%) (30 events)*	Days 0–60 No. of events with sign (%) (107 events)*	Days 61–120 No. of events with sign (%) (35 events)*	% Change
Panting	28 (93)	90 (84)	17 (49)	−44
Pacing	26 (87)	77 (72)	15 (43)	−44
Trembling	18 (60)	64 (60)	12 (34)	−26
Remain by caregiver	22 (73)	57 (53)	17 (49)	−24
Hiding	22 (73)	61 (57)	12 (34)	−39
Excess salivation	17 (57)	35 (33)	5 (14)	−43
Destructiveness	3 (10)	26 (24)	1 (2)	−8
Excess vocalization	4 (13)	14 (13)	8 (23)	+10
Self-trauma	0 (0)	14 (13)	1 (3)	+3
Elimination	1 (3)	7 (7)	1 (3)	0

*No. of storms with rain, thunder, and lightning.

Table 5—Mean ± SD SPA scores for 18 dogs that were assessed 4 months after completion of a study of treatment for storm phobia

Signs of fear	Baseline	4 months*
Panting	4.3 ± 1.2	1.9 ± 1.9
Pacing	4.3 ± 1.6	2.1 ± 2.0
Trembling	3.8 ± 1.3	1.2 ± 1.5
Remain by caregiver	3.1 ± 1.9	1.4 ± 1.9
Hiding	3.3 ± 2.1	0.5 ± 1.0
Excess salivation	2.6 ± 1.9	1.3 ± 1.9
Destructiveness	2.2 ± 2.1	0.4 ± 1.1
Excess vocalization	2.4 ± 2.2	1.2 ± 2.0
Self-trauma	0.5 ± 1.2	0.0 ± 0.0
Elimination	0.6 ± 1.0	0.0 ± 0.0
Total score	27 ± 6.8	10.1 ± 8.4

*All values were significantly ($P \le 0.05$) less than baseline values.

cific behaviors and included vomiting (33 unchanged, 4 mild, 1 moderate), lethargy (30 unchanged, 6 mild, 2 moderate), diarrhea (34 unchanged, 3 mild, 1 severe), constipation (36 unchanged, 2 mild), increased appetite (35 unchanged, 2 mild, 1 moderate), decreased appetite (31 unchanged, 5 mild, 2 severe), increased thirst (31 unchanged, 3 mild, 4 moderate), decreased thirst (37 unchanged, 1 mild), seizure (38 unchanged), irritability (37 unchanged, 1 mild), and changes in sleep (33 unchanged, 5 mild). No consistent problems were identified.

Laboratory results—Laboratory values obtained at initial evaluation and 120 days were not significantly different.

Follow-up—When dogs completed the study, their caregivers were given the option to discontinue all treatment or continue with some form of treatment. Caregiver choices in this matter varied. Many caregivers were provided with prescriptions for continued use of alprazolam as needed at the same or higher dosages. Caregivers of 18 dogs were interviewed 4 months after the study. Total SPA scores and scores for individual behaviors were significantly less than they had been at the initial evaluation (**Table 5**).

Discussion

Almost all dogs had a degree of improvement in fearful behaviors as measured by caregivers' global assessments, which were affected by differing caregiver perspectives on what did and did not constitute improvement as well as the dogs actual change in behavior. For example, 1 dog was rated as unchanged at the end of the study, because it still did not like to go outside alone in the rain. Nevertheless, its SPA score had decreased from 11 to 4. However, most caregivers focused on major behaviors specifically related to storm phobia. It was common to receive comments from caregivers that were pleased with the results, because their dogs' behaviors were less intense, and it took more intense storms to elicit these behaviors. These comments were consistent with the finding that SPA scores for all behaviors decreased significantly during treatment.

The SPA scores correlated with caregivers' global assessments and provided a better assessment of improvement in major behaviors. Videotaping the response to a sound recording of a storm in a clinical setting did not provide an effective assessment of improve-

ment for several reasons. First, audio recordings of storms do not provide a complete set of storm-related stimuli. Although all dogs responded to a degree during baseline testing, caregivers frequently commented that the response was not nearly as intense as occurred at home. This brings into question the value of DSCC protocols with audio media, because they only provide 1 type of stimulus, and audio simulation of storm sounds may not be similar to sounds in the dogs' home environments. The novel environment of the clinic may have also caused altered responses during the initial evaluation and the final visit. Regardless, videotaping responses to sound recordings of storms in a clinical setting does not appear to be a valid tool for assessing a dog's improvement over time. Instead, caregivers' assessment of dogs' behavior during real storms with complex stimuli is the most valuable assessment device.

Treatment appeared to result in substantial improvement in clinical signs, which remained after treatment was discontinued. Follow-up interviews conducted 4 months after the study revealed that the dogs' behaviors continued to be significantly less intense than at study initiation. Given the lack of total resolution and the fact that fear of severe weather events may be a normal behavior, it may be advisable for caregivers of dogs with storm phobia to maintain a small supply of alprazolam in case of severe storms. Even with the lack of total resolution, treatment of storm phobia with this combination of DSCC and anxiolytic drugs is important from an animal welfare perspective. The decrease in intensity and frequency of behaviors can reasonably be assumed to indicate that the dogs were less afraid. Self-trauma did not occur while dogs received treatment or during the 4 months after treatment. The decrease in damage to the house, through elimination or destructiveness, and in difficulty of maintaining the dog during storms made the dogs better pets from the caregivers' perspectives. Such a result will decrease the likelihood of a dog with storm phobia being relinquished because of intolerable behavior.

References

1. Houpt KA. *Domestic animal behavior for veterinarians and animal scientists.* 3rd ed. Ames, Iowa: Iowa State University Press, 1998;349.
2. Overall KL. Noise phobias in dogs. In: Horwitz DF, Mills DS, Heath S, eds. *BSAVA Manual of canine and feline behavioural medicine.* Gloucester, England: British Small Animal Veterinary Association, 2002;164–172.
3. Shull-Selcer EA, Stagg W. Advances in the understanding of noise phobias. *Vet Clin North Am Small Anim Pract* 1991;21:353–367.
4. King JN, Simpson BS, Overall KL, et al. Treatment of separation anxiety in dogs with clomipramine: results from a prospective, randomized, double-blind, placebo-controlled, parallel-group, multicenter clinical trial. *Appl Anim Behav Sci* 2000;67:255–275.