

# 2008 ACVB/AVSAB SCIENTIFIC PAPER AND POSTER SESSION



**New Orleans, LA • July 18, 2008**

*In cooperation with the*

American College of Veterinary Behaviorists

*and the*

American Veterinary Society of Animal Behavior

# Schedule of Events

## ACVB/AVSAB SCIENTIFIC SESSION • JULY 18, 2008

Time	Title of Presentation	Speaker
<b>7:15-8:15</b>	<b>Registration and breakfast — Sponsored by Lilly</b>	<b>AVSAB</b>
8:15-8:30	Introduction – Presidents' Welcome	Debra Horwitz/ACVB John Ciribassi/AVSAB
<i>Moderator for morning sessions – Debra Horwitz</i>		
8:30 Short	Aggression in a dog following thyroid supplementation	Kathy Meyer
8:45 Short	Elevated levels of total serum thyroxin in dogs with behavioral problems	Gabrielle Carter
9:00 Short	Environmental enrichment of New Zealand rabbits living in laboratory cages	Sabrina Poggiagliolmi
9:15 Short	Association of pruritus with canine anxiety or aggression	Mary Klinck
9:30 Full	<b>RK Anderson ACVB Resident Award</b> Gene mapping owner-directed aggression in English springer spaniels <b>Sponsored by Premier Pet Products</b>	Julia Albright Cornell University
<b>10:00-10:30</b>	<b>Refreshment / exhibit break—Sponsored by Novartis</b>	
10:30 Full	On the communicative nature of barking	Adam Miklosi
11:00 Short	Use of trazodone as an adjunctive treatment for canine anxiety disorders: 56 Cases (1995-2007)	Margaret Gruen
11:15 Short	Peri-operative stress in dogs that underwent elective surgery: evaluation of the antioxidant activity	Carlo Siracusa
11:30 Short	Safety and efficacy of behavior modification techniques used by dog owners	Meghan Herron
11:45 Short	<b>SVBT Member Award</b> Puppy class instructors, subject matter, and business factors: a preliminary survey <b>Sponsored by Premier Pet Products</b>	Ginny Price
<b>12:00-1:30</b>	<b>Lunch, Exhibits, &amp; Posters</b> (See next page for list of posters) — <b>Sponsored by Premier Pet Products</b>	
<i>Moderator for afternoon sessions – John Ciribassi</i>		
1:30 Full	<b>AVSAB Student Award (First Place)</b> Evaluation of the term “guardian” on owner attachment to dogs <b>Sponsored by Premier Pet Products</b>	Timothy Helms Univ. of California at Davis
2:00 Short	Comparison of feline water consumption between still and flowing water sources	Christopher Pachel
2:15 Short	Litter odor control: Carbon vs. Bicarbonate of Soda	Jacqui Neilson
2:30 Full	Effects of dextroamphetamine on motor activity, cardiac frequency and behaviour in beagles	Enid Stiles

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<b>Time</b>	<b>Title of Presentation</b>	<b>Speaker</b>
<b>3:00-3:30</b>	<b>Refreshment / Exhibit Break &amp; Posters—Sponsored by Novartis</b>	
3:30 Short	Evaluation of catnip oil and feline facial pheromone odor on behavior of domestic cats in a research colony	Eranda Rajapaksha
<b>“How I Treat Sessions”</b>		
3:45 Short	Night waking in senior dogs and cats	Gary Landsberg
4:00 Short	Hidden skills of a behaviorist that can help other specialty services.	Emily Levine
4:15 Short	Navigating the personal and emotional aspects of behavior consultations	Christopher Pachel
4:30 Short	“How I Treat” question and answer session	
<b>4:45</b>	<b>Short break</b>	
5:00-6:30	AVSAB General Business Meeting	John Ciribassi
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2	Is bigger better? Litterbox size preference test	Jacqui Neilson
3	Carbamazepine for the treatment of canine aggression: Seven case studies	Gabrielle Carter
4	Retrospective evaluation of the effects of diazepam studying dogs with anxiety-related behavior problems	Meghan Herron
5	<b>AVSAB Student Award (Second Place)</b> Mitigation of sow aggression during group formation for pen gestation	Carrie Ellis University of Pennsylvania

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# **Paper Presentations**

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# Aggression In A Dog Following Thyroid Supplementation

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E. Kathryn Meyer

Veterinary Behavior Clinic, 9039 Gaither Road, Gaithersburg, MD  
ekathymeyer@comcast.net

## Abstract

Hypothyroidism has been reported to contribute to aggressive behavior in dogs and is the topic of much interest among veterinarians as well as dog trainers, breeders, and rescue organizations. Accurate diagnosis of hypothyroidism is often difficult as the currently available tests can be influenced by non-thyroidal illness and concurrent administration of medications, as well as normal daily fluctuations. Presumptive diagnosis of hypothyroidism and thyroid supplementation based on equivocal thyroid test results without supporting clinical signs and/or serum chemistry and hematology evaluation may seem innocuous. However, in this case report, a rescue group instructed owners to have their recently adopted neutered male Beagle thyroid tested for no specified reason. Despite equivocal results, thyroid supplementation was initiated, which resulted in the development of aggression toward the owners and another household dog. The aggression was dose dependent, increasing in severity and frequency with higher doses of L-thyroxine and diminishing in severity and frequency when the dose was reduced. When the supplementation was discontinued after 3 months, the aggression ceased completely. Five weeks after this cessation, the dog developed trembling, disorientation, and anorexia. A small intestinal mass was discovered and excised during exploratory surgery. The dog was euthanized one day post-operatively due to complications and poor prognosis. In this case report, thyroid testing without supporting clinical signs led to inappropriate thyroid supplementation, which was associated the development of aggression.

## Introduction

In the past decade, hypothyroidism as a contributor to aggression in dogs has received some attention in the veterinary literature. Although veterinarians recognize that any medical condition, including endocrinopathies such as hypothyroidism, can affect an animal's behavior and increase irritability, there has been great emphasis placed on the thyroid status of dogs showing aggression by some breeders, trainers, and rescue personnel. Hypothyroidism is a common condition seen in middle aged to aged dogs; however, it is not easy to diagnose. The "gold standard" diagnostic test, the thyroid stimulating hormone (TSH) response

test can no longer be performed because medical grade injectable TSH is commercially unavailable. Consequently, the diagnostician must rely on the patient's signalment, the presence of clinical signs of hypothyroidism, supportive findings in a CBC/chemistry panel, and the results of a thyroid panel, which may include total thyroxine (TT4), total triiodothyronine (TT3), free thyroxine (fT4), free triiodothyronine (fT3), T4 autoantibody, T3 autoantibody, thyroid stimulating hormone (TSH), and thyroglobulin autoantibody (TGAA). These tests vary greatly in diagnostic sensitivity and specificity and must be carefully interpreted. In situations where there is a high index of suspicion but equivocal results, a therapeutic trial may be necessary. However, clear clinical goals should be set. Some authors recommend that once a clinical resolution has occurred, the therapy should be withdrawn. The recurrence of the clinical signs will then confirm the diagnosis.

The author has clinically evaluated some dogs with histories of aggression that were placed on thyroid hormone supplementation by the referring veterinarian. In several cases, the owners reported increased aggression associated with thyroid supplementation, which resolved following discontinuation of the therapy. However, since these dogs demonstrated a baseline level of aggression prior to the thyroid supplementation and live in complex environments where triggers for aggression can vary from day to day, a clear association could not be made. In contrast, the following case report describes a dog that showed no aggression toward its owners until thyroid supplementation was initiated. The aggression was reduced when the dose of thyroid supplementation was reduced and resolved when thyroid supplementation was discontinued.

### **Case Report**

An approximately 3-year-old, 16.8 kg, neutered male Beagle, was presented to the author for behavioral evaluation because of aggression directed toward the owners and the other household dog. The dog had been adopted 4.5 months prior to presentation. During the first 6 weeks in the home, no aggression was noted. Thyroid panel testing (see Table 1) was done at the request of the rescue organization for unspecified reasons. The TT4 was slightly below reference range (TT4=11 nm/L, range 15-67) although fT4 and TSH were within reference range.

## Results of thyroid panel tests

Thyroid supplementation		Pre-treatment	0.2 mg BID	0.4 mg BID
		baseline	11 weeks	13.5 weeks
TT4 (nmol/L)	Range 15-67	<b>11</b>	<b>13</b>	23
fT4 (pmol/L)	Range 8-26	11	9	12
TSH (mU/L)	Range 0-20	19	10	7
TGAA (%)	Range 0-35	9	9	7
TT3 (nmol/L)	Range 1.0 – 2.5	1.4	<b>0.7</b>	<b>0.7</b>
fT3 (pmol/L)	Range 4.5 – 12.0	<b>3.2</b>	<b>1.4</b>	<b>2.0</b>

The referring veterinarian placed the dog on 0.4 mg L-thyroxine BID and within 10 days, the dog began to show aggression toward the owners and the other household dog. Following a bite to the male owner, the owners reduced the dose to 0.2 mg BID and the aggressive behavior was decreased, but not eliminated. Following another thyroid panel (time of blood collection following L-thyroxine administration unknown) 11 weeks after the original, the owners were instructed to increase the dose of L-thyroxine to the originally recommended 0.4 mg BID because the TT4 was still below reference range, at 13 nm/L, and the fT4 was decreased slightly, but was still within reference range. Over the next 19 days, the dog's aggression escalated again, with him growling at both owners, the household dog, and biting the male owner. Nineteen days after the second thyroid panel was submitted, a third thyroid panel was run (time of blood collection following L-thyroxine administration unknown). This time, the TT4 had increased to 23 nm/L but the fT4 remained nearly unchanged from the pretreatment value. A CBC/serum chemistry panel was also evaluated and hypoalbuminemia (albumin=2.1 g/dL [ranged 2.7-4.4]) and microcytic, hypochromic anemia (hemoglobin=10.8 g/dL [12.1–20.3], hematocrit=33.8% [36 – 60], MCV=56 fl [58-79], MCH=18 pg [19-28]) were noted. The referring veterinarian's record notes a recommendation to radiograph the dog's chest and abdomen, but this never occurred. Because of the dog's severe aggression, the owners again halved the dose of L-thyroxine and, once more, a marked reduction in aggression was noted within one to two weeks. No more bites were reported but the dog continued to occasionally growl at the male owner and household dog.

Based on the owners' description of aggression, which occurred in close association with thyroid supplementation, the lack of any pre-treatment clinical signs that

could be related to hypothyroidism, and the equivocal thyroid panel results, the dog's thyroid supplementation was discontinued and his behavior was monitored. The owners were also counseled on reducing triggers for aggression, techniques for defusing conflict, and providing structured interactions. The owners reported that by 10 days post-discontinuation of the thyroid supplementation, the dog's behavior had improved dramatically and he did not show any aggression, even growling, toward the owners or the other dog. Five weeks after presentation, the dog developed trembling, disorientation, and anorexia. The dog's condition deteriorated rapidly and during exploratory abdominal surgery, a large mass in the small intestine was discovered and resected. The dog also underwent a splenectomy due to apparent metastasis. The dog was in critical condition following surgery, developed pulmonary edema, and the owners elected euthanasia. No histopathology was done on the intestinal mass to further characterize it.

## **Discussion**

In retrospect, it is likely that this dog's pretreatment TT4 was slightly below reference range because of the non-thyroid illness of an intestinal mass. TT4 is recognized as being more influenced by non-thyroidal illness than fT4, which is why fT4 and TSH values should be evaluated in conjunction with TT4 to more accurately assess thyroid function. T3 is not considered to be as useful a parameter and may be of little use in diagnosing or monitoring the treatment of hypothyroidism. The decreased values for TT3 and fT3 following thyroid treatment may have reflected this dog's progressing but undiagnosed intestinal mass.

There was a strong temporal relationship between thyroid supplementation and this dog's aggression. However, it is possible that, since the dog was only in the home for 6 weeks prior to the development of the aggressive behavior, this behavior might have emerged over time even in the absence of thyroid supplementation. The fact that the aggression escalated and diminished based on the dose of the L-thyroxine does not support this. Additionally, it is possible that the management and behavior modification techniques had a role in the resolution of the aggression, since they were instituted at the same time as the supplementation was discontinued. However, prior to receiving these recommendations, aggression was reduced for two separate periods of time following a decrease in the dose of the L-thyroxine. This case report suggests that thyroid supplementation in a euthyroid dog was associated with aggressive behavior which resolved with withdrawal of the supplementation.

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# Elevated Levels of Total Serum Thyroxin In Dogs With Behavior Problems

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G.R.Carter,\* A.U. Luescher  
Behavior Service, Veterinary Clinical Sciences,  
Purdue University, Indiana, USA 47906.  
\*Corresponding author: [gcarter@purdue.edu](mailto:gcarter@purdue.edu)

## Introduction

There are reports of behavioral change in dogs associated with hypothyroidism. Conversely, alterations in measures of thyroid gland status have been reported in dogs with behavioral problems. The aim of this study was to determine if a relationship between thyroid function and behavior problems in dogs can be identified by measuring levels of serum total thyroxin (TT4), and thyroid stimulating hormone (TSH).

## Materials and Methods

Levels of TT4 and TSH in 39 dogs with behavior problems presenting to a veterinary behavior referral clinic (test group), were compared with levels in 39 dogs without behavior problems, presenting to five community practices (control group). Dogs in the control group were matched for age and breed to the test group, were determined to be disease free by a veterinarian, and were assessed as being without behavior problems by seven yes/no questions.

## Results

Dogs with behavioral problems had higher levels of TT4 than dogs without behavioral problems (signed rank test:  $S = 164$ ,  $p < 0.05$ , t-test:  $t = 2.77$ ,  $p < 0.05$ ). There was no significant difference for values of TSH between the two groups. Two dogs with behavior problems and one dog without behavior problems had results suggestive of hypothyroidism. All other dogs had results consistent with euthyroid status.

## Conclusions

Dogs with behavior problems had significantly higher levels of TT4, suggesting alterations in TT4 levels may occur in association with behavioral problems. A correlation between behavior problems in dogs and thyroid dysfunction was not established.

## Keywords

behavior, dog, hypothyroidism.



# Environmental Enrichment of New Zealand Rabbits Living In Laboratory Cages

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S. Poggiagliolmi,\* S.L. Crowell-Davis

Department of Anatomy and Radiology, College of Veterinary Medicine,  
University of Georgia, Athens, GA 30602

\*Corresponding author: [sabrinap@uga.edu](mailto:sabrinap@uga.edu)

Thirteen male single housed New Zealand Rabbits were offered three different toys in order to evaluate the time spent chewing on the toys and grooming themselves instead of on any of the cage's parts. Single cardboard rolls (3 in. long), five cardboard rings or rubber balls with a bell inside were offered to each rabbit for two separate one week periods. Order of offering toys was randomized. Each rabbit was monitored fifteen minutes four times a week to total 1 hour of observation each week, for a total of 2 hours observation per rabbit per toy. Data was analyzed using the General Linear Model for Repeated Measures (SPSS). The rabbits spent 595+504 seconds chewing the roll, 690+458 seconds chewing the rings and 409+309 seconds chewing the rubber ball. They spent 190+163 seconds chewing the cage when the roll was present, 107+87 seconds chewing the cage when the rings were present and 128+187 seconds chewing the cage when the rubber ball was present. There were substantial and significant ( $p < 0.005$ ) individual differences in response to the various toys, but no significant effect of which toy was present on these two behaviors. Rabbits spent 980+627 seconds grooming when the roll was present, 623+318 seconds grooming when the rings were present and 482+361 seconds grooming when the rubber ball was present. There was a significant effect of which toy was present on the amount of time spent grooming ( $p = 0.02$ ), as well as significant individual differences ( $p < 0.001$ ).

# Association of Pruritus with Canine Anxiety or Aggression

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Mary P. Klinck\*, Frances S. Shofer, Ilana R. Reisner

Department of Clinical Studies – Philadelphia, School of Veterinary Medicine,  
University of Pennsylvania, 3900 Delancey Street, Philadelphia, PA 19104-1060

\*Corresponding author: klinck@vet.upenn.edu

## Introduction

Canine aggression and anxiety may lead to pet relinquishment or euthanasia. There is an association between human anxiety disorders and pruritus. Pruritic skin disease commonly afflicts dogs. Physical discomfort is expected to increase canine aggression. This study was conducted to evaluate the association between pruritus and anxiety and aggression in dogs, for better management and treatment of these disorders.

## Materials and Methods

Information including a ranking of general level of pruritus (0-10 on a visual analog scale) and occurrence of behaviors related to anxiety and aggression was collected for 238 dogs between 1 and 8 years of age, via a questionnaire distributed to dog-owning clients of 3 companion animal practices.

## Results

The median pruritus reported was 2.4. Based on pruritus rating, dogs were assigned to a non-pruritic (0-2.4) or a pruritic (2.5-10) group. There was no significant difference between pruritic and non-pruritic dogs in aggression, nor in reactivity to being alone, exposure to thunderstorms or noises, or unfamiliar people, animals, or objects. In dogs treated with glucocorticoids (N=38, 16%), post-hoc analysis showed increased reactivity to noises and thunderstorms (49% vs 29%;  $p = 0.02$ ).

## Discussion

There was no detectable association between pruritus in dogs and aggressive, anxious, or fearful behavior. Reactivity to noises and thunderstorms was greater in dogs treated with glucocorticoids. Concurrent behavior abnormalities and pruritus in canine patients require treatment of both conditions. Further study to examine the effect of disease and of corticosteroids on canine behavior is warranted.

## Keywords

behavior, corticosteroid, dermatology, dog

# Gene Mapping Owner-Directed Aggression In English Springer Spaniels

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J.D. Albright<sup>1\*</sup>, T.C. Spady<sup>2</sup>, K. Zhao<sup>3</sup>, K.A. Houpt<sup>1</sup>,  
C.D. Bustamante<sup>3</sup>, E.A. Ostrander<sup>2</sup>

<sup>1</sup> Department of Clinical Sciences, College of Veterinary Medicine,  
Cornell University, Ithaca NY 14853

<sup>2</sup> Caner Genetics Branch, National Human Genome Research Institute,  
National Institutes of Health, Bethesda MD 20892

<sup>3</sup> Department of Biological Statistics and Computational Statistics,  
Cornell University, Ithaca NY 14853

\*Corresponding author: [jda24@cornell.edu](mailto:jda24@cornell.edu)

Aggression is the most common presenting complaint to veterinary behavior consultants and a very common reason for relinquishment to a shelter or for euthanasia. The current study proposes that quantitative trait loci for aggression in English springer spaniels (ESS) can be mapped using differences in single nucleotide polymorphisms (SNPs) between aggressive and non-aggressive animals as the first step in revealing the causative genes. One hundred ninety-three ESS were behaviorally phenotyped based on a questionnaire that queried owners regarding the type and severity of aggressive behaviors in 52 different situations (e.g. petting the dog, removing food, moving the dog, etc). Only dogs with extreme phenotypes (e.g. those that have bitten the owner more than three times or those that have not shown aggression in any circumstance) were included.

Whole blood was collected from each dog and DNA was isolated from the samples. Using the Affymetrix version 2 canine SNP array, which contains over 127,000 SNP markers, genotypes have been generated for approximately 30 aggressive and 30 non-aggressive dogs.

Aggressive and non-aggressive dog SNP frequencies were compared for any significant differences using genome-wide association analyses. Single marker analysis was implemented to identify promising regions of the genome. Because genes controlling for behavior are likely to be complex and difficult to identify, a multi-gene-modeling was then be used to identify markers linked to loci with polygenic and epistatic effects.

# On The Communicative Nature of Barking

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Á. Miklósi\*, Cs. Molnár, P. Pongrácz  
Dept of Ethology, Eötvös Lóránd University,  
Budapest, Pázmány P s. 1c, 1117 Hungary  
\* Corresponding author: amiklosi62@gmail.com

## Abstract

In this study we have investigated whether different barks of dogs could be categorized by human listeners, suggesting a communicative role in the dog-human acoustic interaction. We tested whether human listeners could categorize recorded dog barks from various situations, and associate them with adequate emotional ratings. Pre-recorded bark samples from 19 individuals of a Hungarian herding dog breed (Mudi) provided the sample. Three groups of human listeners (Mudi owners, other dog owners, non-owners; n=12 in each) were asked to rate the emotionality of the vocalization as well as to categorize the situations on the basis of alternative situations provided in a questionnaire. We found almost no effect of previous experience with the given dog breed, or owning a dog or not. All the listeners were able to categorize bark situations significantly above the chance level. The emotions described by the listeners for particular bark samples correlated with the peak and fundamental frequency, and inter-bark intervals. Interestingly, we did not find a significant effect of tonality (harmonic-to-noise ratio) on either the emotionality rating or the situation categorization by the human listeners. The human ability to recognize emotional content suggests that the bark of the dog could serve as an effective means of acoustic communication between dog and man.

## Introduction

The casual human observer is often inclined to assume a communicative role of certain animal actions without much hesitation. Ethologists, interested in the natural behavior pattern of animals, however, use a complex methodology to identify action patterns as communicative signals. There is a general agreement that animal signals should provide at least the sender (or both the sender and the receiver) with an advantage over a longer time scale. In addition, there should be indications that the signal has evolved to fulfill this function.

In this review, we applied the ethological concept of animal communication to the analysis of dog barks. Recent research has shown that barking might have been influenced by selection, and may have been modified according to the general rules of vocal communication in mammals (Morton 1977). It might play a role in human-dog communication (and possibly also in dog-dog communication). In ad-

dition, barking is affected by learning through the process of ontogenetic ritualization. Thus, it is possible that barking has acquired and is used in a novel function in dogs in comparison to the ancestral species.

The comparative works of Tembrock (1976) provides a full description of the vocal repertoire of the most common wild canids and their domesticated relative, the dog. These studies show that dogs have very similar vocalizations to the wolves, while jackals and especially foxes display a wider range of vocal signals. Comparing dogs to their closest relatives, the wolf and the coyote, the most interesting difference is that dogs bark in a wider range of situations than the other two species, in which barking accompanies mainly defensive actions or is used as a warning call.

Tembrock (1976) described barking as a mostly repetitive sound, which consists of very short individual barks (one single bark lasts less than 0.5s), and has relatively low dominant frequency (less than 2000 Hz). According to Feddersen-Petersen (2000), wolf barks are characterized by invariably low frequency (dominant frequency is between 145 and 170 Hz), atonal (harsh) sounds and are repeated only 1 or 2 times. In contrast, dog barks cover a very wide frequency range (dominant frequency range is between 160 and 2630 Hz). The harmonic-to-noise-ratio (HNR) analysis showed that the tonality range of dog barks is almost as wide as the range of all other types of vocalizations taken together (Riede et al 2001). The long repeated sequence that could contain more than several dozens of single barks which is a further characteristic species-specific feature.

When investigating a behavioral feature of any species, ethologists are keen to find out the functional significance of the trait. Without much experimentation or systematic work, some researchers have argued that barking may have been a by-product of domestication and thus lack any functional value, whilst others underlined the selective role of the human environment (Feddersen-Petersen 2000). In the following we present some evidence supporting the later interpretation. In our view dog barks function as a means of communication in dogs and conveys ‘information’ about the signalers inner state.

Yin (2002) studied the context-specificity of barking by collecting recordings in three situations (disturbance situation: a doorbell was ringing; isolation: dog was left alone in a room alone; and play). She found that barks emitted by different individuals in different contexts were distinguishable on the basis of acoustic parameters such as frequency and amplitude.

Here we investigate whether humans are able to categorize and describe the content of the barks by listening to recorded vocalizations.

## **Materials and Methods**

We formed three experimental groups depending on the listeners' knowledge about Mudis and their general experiences with dogs: Mudi owners (n=12); other dog owners (n=12), and non-owners (n=12).

### **Source of sound recordings**

Barking vocalizations of a Hungarian sheepdog breed, the Mudi (N=19), were used for this study. All the dogs were kept as pets (by 15 owners) in family houses or apartments.

### **Recording situations**

**'Stranger'**: The experimenter ("stranger") appeared in the owner's garden or at the front door of his/her apartment in the owner's absence. The experimenter recorded the dog's barking during his appearance and intrusion into the garden.

**'Schutzhund'**: The trainer, who acts as the "bad guy", encouraged the dog to bark aggressively and to bite the bandage on the trainer's arm. The owner held the dog on a longer leash during this situation.

**'Going for a Walk'**: The owner was asked to behave as if he/she were preparing to go for a walk with the dog.

**'Alone'**: The owner tied the dog's leash to a tree in a park and walked away out of the dog's sight.

**'Ball'**: The owner held a ball (or a favorite toy of the dog) approximately 1.5 m in front of the dog.

**'Play'**: The owner was asked to play a usual game with the dog, such as tug-of-war, chasing or wrestling.

We collected as many barks from a given dog and in as many situations, as that dog produced barks. In total, 72 barks were used in this study, 12 from each situation originating from different individuals chosen randomly.

The recorded material was transferred to a computer, where a 20 second sample was edited from each bark recording for further analysis and for the playback experiment.

**Inter-bark interval**: The average interval between the individual barks in a 20 second sample.

**Average peak frequency**: The average of the most intense (peak) frequency components of each individual bark in a 20 second sample sequence.

**Average fundamental frequency**: The frequency of the fundamental harmonic of

the given bark. The individual fundamentals were visually confirmed on narrow-band spectrograms after the software chose them automatically. The fundamental frequencies of the individual barks were then averaged within the sample sequences.

**Harmonic-to-noise ratio (HNR):** This parameter serves for the description of the “roughness” of the barking. The calculation of HNR was performed by the method described by Riede et al. (2001), with the difference that we used a 1024-point fast Fourier transform (FFT).

### **Playback experiments**

Each human listener was provided with a unique set of 18 barks prepared in advance. There were 12 listeners in each of the groups. There were 12 barks from different dogs in each of the six situations. Each listener was presented with three different barks from each situation. This resulted in the 18 barks per set. At first, the order of the 12-12 barks in every situation were randomized. Then 3-3 of them were assigned into the individual sets with every bark going into only 3 sets. The randomization of barks were conducted within the individual situations repeatedly for the three groups of listeners. Following the preparation of the sets of 18 barks, it was established that every listener received a truly unique set of barks. A given individual bark was scored by only three listeners within a given group.

Each listener was exposed to one of the prepared sound sets, chosen randomly, before the trial. The barks were played back individually to the listeners, who were allowed to listen to each bark twice. The experimenter handled the player software. The listeners completed a corresponding questionnaire during the experiment. After playing back a given bark sample twice, the experimenter stopped the device, and allowed approximately 30 seconds for the subjects to complete the corresponding row on the questionnaire.

Emotionality ratings (questionnaire 1): Listeners rated each bark sample on a 5-item scale for different content of emotionality: (1) aggressiveness; (2) fearfulness; (3) despair; (4) playfulness; (5) happiness. Low values indicated the absence of that type of “emotion”, while higher values suggested a predominant presence of the emotion in question.

Categorization of situations (questionnaire 2): Subjects categorized each sample into one of the six situations listed on their sheets. The listeners did not know that each situation could be occurring three times.

## Results

At first, we wanted to know if the bark sequences, originating from different situations, differ in the acoustic parameters. One-way ANOVA showed that with the exception of the tonality, the situation has a significant effect on the inter-bark interval ( $F(5,66)=8.98$ ;  $P<0.001$ ), the average peak frequency ( $F(5,66)=4.69$ ;  $P<0.001$ ), and the fundamental frequency of the bark ( $F(5,66)=3.40$ ;  $P<0.01$ ). The post hoc tests showed that barks from the 'Schutzhund' situation had the shortest inter-bark intervals and the barks from the 'alone' and 'ball' situations had the longest inter-bark intervals. The average peak frequency and fundamental frequency were the lowest in the 'stranger' situation, which had significantly lower frequency values of both parameters than the barks from the 'walk', 'play' and 'alone' situations.

### Emotionality ratings

The overall comparison of the three groups' scores on the five emotionality scales showed only small differences among the owners. Thus, we describe only the results of the Mudi owners.

In the 'Mudi owners' group, Friedman ANOVA showed that emotionality traits had a significant effect for most situations except for 'walk' and 'ball' barks. Mudi owners gave the highest scores of 'aggressiveness' to barks recorded in the 'stranger' and 'Schutzhund' situations, they gave significantly higher 'despair' and 'fearfulness' than 'happiness' scores to barks recorded in the 'alone' situation, and they gave the highest scores of 'playfulness' to the 'play' barks in comparison to barks recorded in all the other situations respectively. Additionally, they gave the lowest scores of 'happiness' to the 'alone' barks, and the lowest scores of 'fear' and 'despair' to the 'play' barks (Dunn's post hoc test).

Pearson correlation tests were performed to analyze the possible relationship between the emotionality ratings and the acoustic parameters of the barks. For this analysis, the groups were pooled because no fundamental differences were found between the ratings of the three groups. Mean score were used on each emotionality scale for any given bark. Similarly, we calculated the mean of the acoustic parameters for each bark were calculated. 'aggressiveness' ratings showed negative correlation with the inter-bark interval, fundamental frequency and the average peak frequency of the barks. Ratings for 'despair' correlated positively with the average peak frequency. 'playfulness' showed positive correlation with the inter-bark interval, average peak frequency and fundamental frequency. 'Happiness' correlated positively with the fundamental and average peak frequencies of the barks. There was no evidence of significant correlation in the case of 'fearfulness' with any of the acoustic parameters.



### **Categorization of situations**

Again, the two dog owner groups and non-owners performed very similarly. We found that all of them performed significantly above the chance level (by chance humans could be correct on 3 out of 18 cases: 16.67%): One-sample t-test, 'Mudi owners' (40.74%)  $t(11)=8.22$ ,  $p<0.001$ ; 'other dog owners' (39.35%)  $t(11)=4.08$ ,  $p<0.001$ ; 'non owners' (39.35%)  $t(11)=7.00$ ,  $p<0.001$ . The comparison of groups with different experience with dogs, showed that 'Mudi owners' proved to be only slightly better at guessing the correct situations than listeners in the other two groups. These differences were not significant (One-way ANOVA,  $F(2,33)=0.06$ ,  $p=0.94$ ).

We investigated whether the situation influenced the accuracy of categorization. The percentage of correct answers with One-Way ANOVA and SNK post hoc test were analyzed. The type of situation had a significant effect ( $F(5,210)=10.64$ ;  $p<0.001$ ). The listeners categorized most accurately the barking of dogs in 'stranger', 'Schutzhund' and 'alone' situations. At the same time they showed the poorest results in recognition of 'ball' and 'walk' barks.

A so-called confusion matrix was calculated. (Table 5). This was done to determine which situations were used mostly for misidentified items in cases where the listeners incorrectly categorized a given bark sample. Four situations were quite well identified, 'stranger', 'Schutzhund', 'alone' and 'play'. From these, 'stranger' and 'alone' had no preferred "alternative", as the wrong answers were distributed quite equally among the other situations. On the other hand, 'Schutzhund' was quite often misinterpreted as 'stranger', and 'play' was categorized most often misinterpreted as 'ball'.

### **Discussion**

Results from the two experiments showed that (1) independently from their previous experiences with dogs, human listeners scored the emotional content of barks in similar manner and accuracy; (2) the emotional ratings were in accordance with expectations in view of how the specific situations could affect the emotions of dogs. For example, vocalizations of dogs attacking a stranger in the garden, or performing Schutzhund training were given high scores of aggressiveness, or the vocalizations of dogs left alone and tied to a tree were given high scores of despair. Further, we found evidence that (3) the emotional content as judged by humans correlates with particular acoustic parameters of a given bark, but (4) we did not find major differences in the accuracy of categorization between the performance of the listeners based on their previous experiences with dogs. Human listeners more accurately categorized (5) those situations where they found the

emotional content less ambiguous ('stranger', 'Schutzhund', 'alone' and 'play'), but (6) human listeners could categorize over the chance level the majority of the barking situations on the basis of listening only to the vocalizations.

This suggests that some dog barks may present means for inter-specific communication. Domestication processes resulted in dogs that were more dependent on humans, making them more human oriented (Miklósi et al. 2004). Humans selected for dogs that barked reliably, and in accordance to certain behavioral and emotional situations.

The fact that humans can report the emotional state of a barking dog utilizing certain acoustic features is not surprising. This is because we seem to apply similar acoustic effects when expressing anger, fear or happiness in the acoustic modality. However, in the case of barking, the preference for certain acoustic structure in vocalizations, which reflect the inner state of the signaler, could have been a selective force. Humans may have preferred to interact with dogs that displayed similar acoustic variability in barking. In the same vein, dogs could have gained a selective advantage over their companions in an anthropogenic environment if they were producing barks that were more attractive to humans. Thus, the barking in dogs has evolved towards an acoustic signal that can have a 'universal' utility in dog vocal communication.

### **Acknowledgements**

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**Keywords**

Barking, communication, dog, dog-human interaction, domestication frequency

# Use of Trazodone as an Adjunctive Treatment for Canine Anxiety Disorders: 56 Cases (1995-2007)

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\*M. E. Gruen, B. L. Sherman  
College of Veterinary Medicine,  
North Carolina State University, Raleigh, NC 27606  
\*Corresponding author: megruen@ncsu.edu

## Abstract

Treatment of canine anxiety disorders, including separation anxiety and storm phobia, generally involves a combination of behavioral management and a psychotropic medication. Severe cases that have responded inadequately to conventional treatment regimes, cases that relapse over time, and cases compounded by secondary behavioral diagnoses can be frustrating and distressing. To manage such cases, it has become increasingly common for veterinary clinicians to prescribe a secondary pharmacologic agent to enhance management of canine anxiety cases.

This retrospective study reports the use of trazodone hydrochloride as an adjunctive agent for the treatment of anxiety disorders in 56 dogs over a 12 year period. Behavioral diagnoses included separation anxiety, storm phobia, generalized anxiety, and travel anxiety. Trazodone, commonly used in conjunction with other psychotropic agents in humans, was given in combination with medications from several drug classes, including SSRIs, TCAs, benzodiazepines, and azapirones. The majority of these dogs achieved adequate reduction in their anxiety, as determined by their owners. While further study of dose range and efficacy are needed, the findings suggest that trazodone hydrochloride is a well-tolerated and effective adjunctive agent for the treatment of canine anxiety disorders. This provides an additional therapeutic option for use in cases resistant to conventional treatment.

Keywords: anxiety, dog, trazodone, welfare

# Perioperative Stress In Dogs That Underwent Elective Surgery: Evaluation Of The Antioxidant Activity

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C. Siracusa<sup>1\*</sup>, R. Neville<sup>2</sup>, X. Manteca<sup>3</sup>, J. Pastor<sup>1</sup>, D. Mills<sup>2</sup>

<sup>1</sup> Department of Veterinary Medicine and Surgery, Universitat Autònoma de Barcelona, Edif. V Campus UAB, 08193 Bellaterra (Barcelona), Spain

<sup>2</sup> Department of Biological Sciences, University of Lincoln, Riseholme Park, Lincoln LN2 2LG, UK

<sup>3</sup> Department of Animal Sciences and Nutrition, Universitat Autònoma de Barcelona, Edif. V Campus UAB, 08193 Bellaterra (Barcelona), Spain

\* Corresponding author: Carlo.Siracusa@uab.cat

Current address: Department of Clinical Studies – Phila, School of Veterinary Medicine, University of Pennsylvania, 3900 Delancey St, Philadelphia PA 19104, USA

## Abstract

Perioperative stress is experienced by animals undergoing surgery, causing both physical and psychological stress. Significant variations in antioxidant activity of experimental animals experiencing stress have been documented. The objective of this preliminary study was to describe the antioxidant stress responses in dogs that underwent elective surgery. Sixteen dogs were submitted to elective orchietomy or ovariohysterectomy. Concentrations of the serum superoxide dismutase (SOD) and of the 8-hydroxy-2'-deoxyguanosine (8-OhdG), together with the ferric reducing ability of plasma (FRAP) were measured. Values of biomarkers studied at pre and postoperative times and differences from basal values were analyzed. Compared to basal values, the markers studied did not show significant variations due to perioperative stress. These preliminary results suggest that SOD, 8-OhdG and FRAP are not affected by the perioperative stress response in healthy dogs that underwent elective surgery, and thus they are not sensitive tools for dog welfare assessment in the clinical surgery setting.

## Introduction

Perioperative stress is experienced by animals undergoing surgery, due to surgery intervention itself and to related procedures. During pre-surgery, the confinement in a new and uncontrolled environment and handling procedures can activate the stress response. During post-surgery, the pain experienced by the animal and effects of anaesthesia and analgesia represent the major stressors. Significant perioperative changes in behavioral, neuroendocrine, immune and acute phase

responses of dogs undergoing elective orchiectomy and ovariohysterectomy were recently described (Siracusa *et al* in press), suggesting that surgery and related procedures represented for these animals a major source of stress. Previous studies evidenced significant variations in the antioxidant activity of experimental animals that underwent psychological and physical stress (Thi Thu Huong *et al* 2005; Wang *et al* 2006). Our hypothesis was that variations in the antioxidant activity could also be a useful biomarker for evaluating the perioperative stress response. Both preoperative psychological and postoperative multifactorial stress appear to be involved in perioperative response, confirming the importance of giving adequate consideration to all these factors from the perspective of animal welfare and recovery. Thus, the objective of this preliminary study was to describe the antioxidant stress responses in dogs that underwent elective surgery in normal clinical practice conditions.

### **Materials and Methods**

Sixteen sheltered dogs, regularly fed with a premium quality dry food, were submitted to elective orchiectomy or ovariohysterectomy. A standardised surgical protocol was used. The dogs were pre-medicated with Buprenorphine 0.01 mg/kg IM (Buprex<sup>®</sup>, Schering-Plough SA, Madrid, Spain), induced with Thiobarbital 10 mg/kg IV (Tiobarbital<sup>®</sup>, B Braun Medical, Barcelona, Spain) and Diazepam 0.5 mg/kg IV (Valium<sup>®</sup>, Roche Farma SA, Barcelona, Spain). The anaesthesia was maintained with isoflurane 1-2% (Isoflo<sup>®</sup>, Abbot Laboratories, Illinois, USA) vaporised in 100% oxygen 0.5-1 L/minute, delivered with a semi-disposable circle circuit (Burtons Medical Equipment Ltd, Kent, UK). The vaporiser setting was adjusted to maintain a surgical plane of anaesthesia as judged by eye position, jaw tone and lack of response to noxious stimuli. Surgery was considered to be finalized with extubation of the animal.

Each animal was confined in the Intensive Care Unit (ICU) for 30 minutes pre and post-surgery. Serum samples were collected both in the dogs' usual environment (T0 and T3) and during ICU confinement times (T1 and T2) (see Table 1). Samples were stored at – 80 degree Celsius and then sent to the laboratory for analysis. **Serum superoxide dismutase (SOD) and 8-hydroxy-2'-deoxyguanosine (8-OhdG; biomarker of DNA damage)** variations were evaluated by ELISA methods (Calbiochem Superoxide Dismutase Assay Kit II, EMD Bioscience, Darmstadt, Germany; StressXpress DNA Damage<sup>®</sup> ELISA Kit, Assay Designs, Ann Arbor, USA). **Ferric reducing ability of plasma (FRAP)** was measured using a colorimetric method based on a ferric to ferrous ion reduction (Benzie & Strain 1996). Values of parameters studied at different times and differences from basal values were analyzed by paired t tests for data showing a normal distribution, and by a

Wilcoxon test for those that did not. SPSS® 13.0 software (SPSS Inc., Chicago, USA) was used for calculations. Differences were considered significant when  $P < 0.05$ .

## Results

Results are presented in Table 1. Compared to basal values, SOD, 8-OhdG and FRAP did not show significant variations due to perioperative stress ( $P > 0.05$ , for all markers and times considered). Peak values were reached at preoperative time after confinement in the ICU cage (T1) for all the biomarkers studied.

Table 1

Biomarker	T0	T1	T2	T3
SOD (U/ml)	0.033±0.019	0.045±0.028	0.026±0.024	0.031±0.024
8-OhdG (ng/ml)	17.973±4.704	23.879±15.544	19.791±7.785	16.334±5.432
FRAP (mM/I Fell)	0.486±0.111	0.532±0.112	0.499±0.125	0.470±0.093

*Table 1. Variations in antioxidants' activity. Timing: T0 = preoperative in dogs' usual environment (basal values); T1 = preoperative ICU cage; T2 = postoperative ICU cage; T3 = postoperative in dogs' usual environment. Values are represented by Mean ± SD.*

## Discussion

No significant changes in SOD, 8-OhdG and total antioxidant concentration, measured by FRAP, due to perioperative stress in dogs undergoing elective surgery were seen in this trial. Similar results were obtained in dairy cows after abdominal surgery, where no significant variations in FRAP were detected, even if cortisol and glucose experienced a significant increase (Mudron et al 2007).

SOD is an antioxidant enzyme and its activity is commonly used as an indicator of the “oxidative status”. Differently, 8-OhdG is a modified nucleoside base, commonly studied by-product of DNA damage induced by oxidative stress. FRAP provides general information about the non-enzymatic anti-oxidant systems of animals (Dotan et al 2004). Our results suggest that a good preoperative state of all these defense mechanisms, provided also by an appropriate diet, guarantees a good antioxidant response after surgery, preventing an increase in the oxidative stress experienced by the animal.

In conclusion, these preliminary results suggest that serum SOD, 8-OhdG and FRAP concentrations are not affected by the perioperative stress of healthy dogs that underwent elective orchiectomy and ovariohysterectomy. Thus the biomarkers

studied are not sensitive tools for dog welfare assessment in the clinical surgery setting.

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## Keywords

Antioxidant, Dog, Stress, Surgery

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# Safety and Efficacy of Behavior Modification Techniques Used By Dog Owners

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M.E. Herron,\* F.S. Shofer, and I.R. Reisner  
Dept. of Clinical Studies, School of Veterinary Medicine, University of  
Pennsylvania, 3900 Delancey St., Philadelphia, PA 19104-6010  
Corresponding author: mherron@vet.upenn.edu

## Introduction

Prior to seeking the counsel of a veterinary behaviorist many owners have attempted behavior modification techniques suggested by a variety of sources. Recommendations often include aversive training techniques which may provoke fearful or defensively aggressive behavior. The purpose of this study was to assess the behavioral effects and safety risks of techniques used historically by owners of dogs with behavior problems.

## Methods

A 30-item survey of previous interventions was included in a behavioral questionnaire distributed to all dog owners making appointments at a referral behavior service over a one-year period. For each intervention applied, owners were asked to indicate whether there was a positive, negative, or lack of effect on the dog's behavior, and whether aggressive behavior was seen in association with the method used. Owners were also asked to indicate the source of each recommendation.

## Results

141 surveys were completed. The most frequently listed recommendation sources were "self" and "trainers." Twenty-four technique categories, including confrontational methods such as "hit or kick dog for undesirable behavior" (43%), "growl at dog" (41%), "alpha roll" (31%), "stare at or stare [dog] down" (30%), and "dominance down" (29%), elicited an aggressive response from at least one dog.

## Conclusion

Confrontational techniques applied by dog owners before their pets were presented for a behavior consultation were associated with aggressive responses in many cases. It is thus important for primary care veterinarians to advise owners about risks associated with such training methods and provide guidance and resources for safe management of behavior problems.

## Keywords

Aggression, behavior modification, dog

# **Puppy Class Instructors, Subject Matter, and Business Factors: A Preliminary Survey**

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V. L. Price\*, J. K. Shaw

Veterinary Technology Program, Saint Petersburg College, P.O. Box 13489,  
Saint Petersburg, FL 33733 (price.ginny@spcollege.edu)

## **Abstract**

An online survey was conducted to assess the characteristics of (dog [Canis familiaris]) puppy class instructors and how they organized and ran their classes. Through frequencies and correlations, hypotheses were tested within this group of instructors. Due to the sampling method used (volunteer sampling) the results cannot be generalized to the population of puppy class instructors.

## **Introduction**

The socialization period for domestic dogs spans their third through their twelfth to fourteenth week of age (Scott & Fuller 1965). During this time puppies should be exposed to people of different appearance, movement, and vocalizations. They should be exposed to different situations and other species of animals as well as other dogs. Animals exposed to a wide variety of stimuli during their socialization period are less likely to exhibit fearful behavior (Scott & Fuller 1965). Puppy classes are a convenient way for owners to expose their puppies to different stimuli in a controlled situation. Fear and aggression can be induced if training includes stimuli that cause fear and/or pain thus training techniques are of interest.

## **Hypotheses**

The number of instructors/assistants teaching a puppy class will have a positive correlation with the number of puppies attending class. The education level of the instructors will have a positive correlation with the price they charged for their classes. There will be a positive correlation between veterinary support for puppy classes and veterinary staff support for puppy classes. There will be a positive correlation between the size of the facility and the number of puppies allowed in the class. There will be a positive correlation between the education level of instructors and the type of training equipment and techniques they used. The minimum age of puppies allowed in class will be positively correlated with the instructor's vaccine requirements for puppies. The maximum age of puppies allowed in class will be positively correlated with the instructor's vaccine requirements for puppies. Instructors will require vaccine waiting periods that coincide with vaccine manufacturer recommendations.

## **Materials and Methods**

The survey was written and then posted on the Purdue University veterinary behavior clinic website from August, 2006 through June, 2007. Links to the survey were posted to multiple listservs and the information was asked to be cross posted to other lists. Listservs originally targeted included: Association of Pet Dog Trainers, Certified Pet Dog Trainers, Society of Veterinary Behavior Technicians, American Veterinary Society of Animal Behavior, Animal Behavior Society, American College of Veterinary Behaviorists, various service dog links and various breeder links.

### **Data**

The data were submitted through online data entry with the results being automatically emailed to the veterinary technician survey designer. The results were then hand entered into an excel database by another technician. Nominal data were transformed into numerical terms for analysis.

### **Data Analysis**

Data were analyzed using SPSS 13.0 GradPack and Microsoft Office Excel 2003 using various frequency and correlational methods. For nominal data a Phi coefficient was used. A Pearson's coefficient was used for interval data. Spearman's rho was used to calculate the correlation of ranks. Frequencies were used to compute sums and percentages for much of the data. Modes were used to determine the most frequently found number of puppies in a class and the most frequent size of a training facility.

## **Results**

### **Frequencies**

This was an information gathering survey about who puppy class instructors are, where, and how they teach their classes. Although results cannot be generalized to puppy class instructors as a whole, due to the volunteer sampling method, we can report on what was found in this group of 213 instructors. For example, in this group of 213 instructors who responded to the survey 178 were teaching in the United States, 16 in Australia, 9 in the United Kingdom, 8 in Canada, and 1 in South Africa, Japan, and Ireland. Looking at experience levels, 113 out of 213 participants were teaching for more than five years while only 3 were teaching for a year or less. The rest of the participants reported teaching for 2-3 years (38) or for 4-5 years (42).

### **Correlations**

Because the number of assistants and the number of puppies are both interval

variables we were able to use the Pearson correlational coefficient to show that the number of puppies was correlated with the number of instructors and assistants in class ( $r=0.193$ ,  $p<0.01$ ). This was a weak correlation showing a tendency for numbers of puppies to increase when the numbers of instructors increased. These results are likely a by product of most classes having few if any assistants as 73 classes had no assistant and 78 classes had one assistant ( $N=207$ ). Most of the classes had five or six puppies in them no matter how many assistants they had (93 out of 213).

There was no statistically significant relationship between the instructor's educational level and the amount of money they charged for their puppy classes ( $\Phi=0.779$ ,  $p=0.572$ ). There were no statistically significant differences for collar type used between instructors with a CPDT and those without ( $\Phi=-0.068$ ,  $p=0.321$ ). In this comparison collars were grouped together in aversive versus non-aversive groups. The aversive collars were the choke, nylon slip and pinch while the non-aversive collars were the buckle, head collar, halter, and no pull halter. There was no statistical difference between CPDT versus non-CPDT instructors in their use of spray bottles to punish the behavior of puppies ( $\Phi=-0.116$ ,  $p=0.089$ ).

Veterinarian and veterinary staff support had a strong positive correlation thus whatever the level of veterinary support was for classes this same level was found in the staff of the hospital and vice versa (Spearman's  $\rho=0.712$ ,  $p<0.0001$ ). There was a statistically significant correlation between the size of the training location and the number of puppies allowed in the class ( $r=0.207$ ,  $p<0.004$ ); this relationship was relatively weak ( $\text{Eta}=0.25$ ). The minimum age of puppies allowed in a puppy class was found to be positively correlated with the required vaccines for class; this relationship was statistically significant ( $\Phi=0.829$ ,  $p<0.0001$ ). The maximum age of puppies was not correlated with the vaccine requirements that instructors reported ( $\Phi=0.746$ ,  $p=0.166$ ).

## **Discussion**

This survey used a voluntary sample of participants, which prevented generalization of the information gathered to the population of puppy class instructors. In future work we would like to conduct a similar survey using a random sample. As far as we could determine, this is the first survey to be conducted of puppy class instructors and their teaching and business techniques.

## **Acknowledgements**

We would like to thank Purdue University for allowing us the use of their website

and Andrew Luescher for his support. We would also like to thank Jessica Harding for the work she did creating the survey and Megan Harris for her data entry work.

### **Reference**

Scott JP, Fuller JL 1965. Genetics and the social behavior of the dog: The classic study. University of Chicago Press, Chicago, IL.

### **Keywords**

class, dog, instructors, puppy, socialization, survey

## **Evaluation of the Term “Guardian” on Owner Attachment to Dogs**

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T.D. Helms; \*M.J. Bain

School of Veterinary Medicine, University of California, Davis  
One Shields Avenue, Davis, CA 95616

\*M.J. Bain: [mjbain@ucdavis.edu](mailto:mjbain@ucdavis.edu)

There has been a push by some organizations to change the wording in municipal codes in relation to companion animals from “owner” to “guardian” to help bring about a change in attitudes of people towards animals. The goal of this study was to evaluate the effects of the term “guardian” on owner attachment to dogs, as well as relationship between owner attachment and incidence of problem behaviors. The cross-sectional study of 274 owners was conducted via standardized surveys of owners visiting full-service veterinary clinics and mobile vaccination clinics in an “owner” city and in an “owner/guardian” city. Attachment was related to the city of residence, owner age, and behavioral satisfaction. Owners residing in an “owner/guardian” city had a lower attachment score, both alone, and related to younger owner age and lower satisfaction with their dogs’ behavior. There was no significant difference in percentage of dogs vaccinated for rabies in each type of city, nor any difference in rate of licensure. There was no significant difference in attachment levels when comparing the mobile vaccine clinics to the free-standing clinics. Owners with more than one dog in their household reported a higher attachment to their dog than owners of a single dog. There was no effect of whether or not an owner was female on their attachment to their dog. Although the data does not suggest a negative impact from the term “guardian” being used, the wording change does not provide any apparent benefit to the human-animal bond.

# Comparison of Feline Water Consumption Between Still and Flowing Water Sources

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C.L. Pachel

Twin Cities Veterinary Behavior Referral Service, LLC  
PO Pox 1059, White Bear Lake, MN 55110  
drpachel@tcvetbehavior.com

## Introduction:

Strategies such as dietary changes and increasing water consumption have been recommended for decreasing the incidence of feline lower urinary tract disease (Markwell et al. 1998). The goal of this study was to measure feline water consumption rates from still and flowing water sources to determine whether this experimental condition influences the consumption rate.

## Materials and Methods:

Cats participating in the study were selected from the entire population of cats in a metropolitan area shelter. Nine cats were individually housed in a single bank of kennels; each kennel was set up with a litter box, water source and free choice dry food. The water source used was a Petmate Fresh Flow® Pet Fountain, 50oz. capacity (Petmate, Arlington, Texas). Water consumption was measured with flowing and still conditions during four consecutive 24 hour periods following a 24 hour habituation period to the environment and study location. Each cat served as their own control and was randomly exposed to both experimental conditions.

## Results:

Mean water consumption per 24 hour period for the still condition was 109.83mL; mean consumption per 24 hour period for the flowing condition was 115.44mL. Paired t-test for the entire dataset using the average response per treatment level showed that the difference between conditions was not determined to be statistically significant ( $t = 0.2842$ , 8df, p-value 0.7835).

## References:

Markwell PJ, Buffington CT, Smith BHE, 1998. The effect of diet on lower urinary tract diseases in cats. *Journal of Nutrition* 128 2753S-2757S.

## Keywords:

Animal behavior, cat, water consumption

# Litter Odor Control: Carbon vs. Bicarbonate of Soda

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Jacqueline C. Neilson

Animal Behavior Clinic 809 SE Powell Blvd., Portland, OR 97202 USA  
abcjndvm@hevanet.com

## Abstract

Efficacy of two litter odor control additives, bicarbonate of soda and carbon, were tested in a population of cats. Cats housed in four colony rooms at a shelter were given access to two identical litterboxes with the exception of the litter odor control additive. Excrement was collected from the boxes over four consecutive 12-hour overnight test periods. The amount of excrement was analyzed via both parametric (ANOVA) and non-parametric (Friedman Test) tests using a randomized block design. Cats showed a significant ( $p < 0.05$ ) preference for the litterbox with carbon additive, suggesting that felines prefer carbon over bicarbonate of soda as an odor control additive.

## Introduction

Litterbox odor control is important to owners and also thought to be important to cats. A malodorous box has been implicated as a cause of feline litterbox aversion and resulting inappropriate elimination. Litters often contain additives to help with odor control. Two of the top selling litter brands use different additives for odor control: carbon and bicarbonate of soda. The purpose of this study is to identify if cats preferentially use a litterbox with one of these additives implying that one additive has superior odor control properties.

## Materials and Methods

Eight identical, new, large, uncovered plastic litterboxes were purchased for use in the study. Two litters, identical in every parameter with the exception of the odor control additives, were used in the study. The litters were a sodium bentonite (clumping) base. The two different odor control additives were reactivated carbon and bicarbonate of soda.

The study site was at a local shelter. Thirty-two adult cats housed in four separate colony rooms served as the study subjects. The typical litterbox set up in the colony rooms, prior to study implementation, was two uncovered litterboxes with clay, non-clumping litter placed in one corner of the room, approximately 6 inches apart. These were removed and replaced with two test boxes, identical in every



manner with the exception of the odor control additives. One test box in each colony room contained clumping litter with bicarbonate of soda additive (BS) and the other test box contained clumping litter with carbon additive (C). All boxes were filled with equal amounts of their respective litters to a 2" depth.

The study ran over four consecutive nights from approximately 6 pm to 6 am. The test boxes were placed in the rooms at approximately 6 pm in the evening. The investigator returned 12 hours later to scoop, remove and weigh excrement. The boxes were measured for litter depth after scooping with the intention of equalizing the box litter levels if there was a discrepancy of greater than 0.5 inches; this did not occur over the course of the study. Each morning after excrement removal, the boxes were covered with plastic wrap and stored during the day in a secure location in the shelter. The plastic wrap was removed and the boxes reintroduced into the colony rooms the following night at 6 pm, with locations reversed from placement on the previous night.

The cats in the colony rooms remained relatively stable over the course of the study, however the cats were in a shelter setting and available for adoption so there were some subject changes during the course of the four day study period.

## **Results**

Four colony rooms were utilized on night one, however due to an unanticipated construction project in colony room 1, the cats had to be temporarily relocated and the room was not available for further use. On the morning following night four of the study, a staff member inadvertently dumped the litter and excrement of the test litterboxes in room 2, making those results unavailable. With these issues, data was collected for 12 overnight periods.

Table 1 shows the amount of excrement (in grams) removed each morning from each box. When the figures are added together, the total grams of excrement in carbon enhanced litter was 4679 grams and the total grams of excrement in bicarbonate of soda enhanced litter was 3720 grams.

The amount of excrement was analyzed via both parametric (ANOVA) and non-parametric (Friedman Test) tests using a randomized block design by room. There was a significant treatment effect ( $p = 0.047$ ) for carbon enhancement. The Friedman Test showed a similar significant treatment effect for carbon enhanced litter ( $p = 0.046$ ).

**Table 1: Excrement (in grams) removed from the boxes**

	Room 1		Room 2		Room 3		Room 4	
	C	BS	C	BS	C	BS	C	BS
Night 1	416	134	359	334	172	76	194	472
Night 2			247	163	230	210	706	437
Night 3			382	442	97	382	552	331
Night 4					739	345	585	394
Total	416	134	988	939	1238	1013	2037	1634

C = Carbon; BS = Bicarbonate of Soda

### Discussion

Carbon enhanced litter had significantly more excrement deposited in it than did bicarbonate of soda enhanced litter, suggesting that it was the preferred litter. Aside from the odor control additive (carbon vs. bicarbonate of soda) attempts were made to make all other possible variables equal (base litter, box color, box style, box location) so that they did not impact box usage. However there were some differences that we were unable to equalize: the carbon additive was darker than the bicarbonate of soda additive, creating a color difference between the test litters. Also, although not obvious to the human nose, the additives may have imparted different scents to the litter, impacting use.

Other variables that may have impacted study results are social dynamics between the cats in the colony room. While the boxes were placed in close proximity to try to minimize box guarding as a factor, sometimes cats will actually rest or sleep inside a box, creating a physical barrier to its usage. It is possible that this occurred during the overnight period, thus impacting results.

This study used the weight of the excrement as the measure of box usage. While relatively simple and inexpensive to do, it is a relatively crude measurement of box usage. For example, one large urination by a big cat could equal the weight of three smaller urinations by petite cats. By collecting multiple data points, hopefully the impact of this issue was minimized. A preferred method of measurement would be time spent in boxes, however it would require electronic surveillance that was beyond the practical limits of this study.

While the scoopable excrement was removed from the boxes at the end of every 12 -hour test period, eventually the litter becomes soiled due to breakage of clumps and/or small particles remaining in the box that cannot be scooped. This residual soiling is what drives the recommendation for complete box change

periodically in households using clumping litter. In the study setting, the high cat population density in relation to litterboxes (8 cats/2 boxes) caused the litter to be soiled more rapidly. Therefore by night four, the litter odor control additives were probably being the most challenged. It is of interest to note that carbon outperformed baking soda in both test rooms on night four, suggesting that perhaps the benefits of superior odor control are most likely to be seen toward the end of the litter cycle when the litter has sustained more soiling.

### **Acknowledgements**

The author would like to thank Clorox® for study sponsorship and statistical support and the Oregon Humane Society for the use of their facilities and cats.

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### **Keywords**

Carbon Elimination, Feline, Litter Odor

# Effects of Dextroamphetamine on Motor Activity, Cardiac Frequency, and Behavior in Beagles

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E.K. Stiles <sup>a\*</sup>, C. Palestrini <sup>b</sup>, G. Beauchamp <sup>a</sup>, D. Frank <sup>a</sup>

<sup>a</sup> Université de Montréal, Faculté de Médecine Vétérinaire, Centre Hospitalier  
Universitaire Vétérinaire, C.P. 5000, St-Hyacinthe, QC, Canada, J2S 7C6

<sup>b</sup> Dipartimento di Scienze Animali, Sez. di Zootecnica, Facoltà di Medicina  
Veterinaria, Università degli Studi di Milano, Via Celoria 10, 20133, Milano Italy

\*Corresponding author: petbehavior@gmail.com

## Abstract

According to several American veterinary behaviorists, hyperactivity (“hyperkinesis”) can be distinguished from over activity by paradoxical physiological and behavioral responses of dogs given dextroamphetamine or methylphenidate (CNS stimulants). In this study, 12 beagle dogs from a research colony aged 13 to 20 months of age were used to measure the effects of dextroamphetamine (0.2mg/kg) on cardiac frequency, motor activity, and general behavioral changes. Prior to and following administration of the treatment, dogs were recorded by video, Polar® (heart rate) and Actical® (accelerometer) software. Although not all results are finalized at this time, the preliminary results seem to indicate that administration of dextroamphetamine may not be a reliable indicator of “hyperkinesis”. Collar mounted accelerometers were found to be an objective measure of motor activity.

## Introduction

According to several American veterinary behaviorists, hyperactivity (“hyperkinesis”) can be distinguished from over activity by the physiological and behavioral response of dogs given central nervous system (CNS) stimulants such as dextroamphetamine or methylphenidate (Campbell 1992; Crowell-Davis S & Murray 2006; Landsberg et al 2003; Voith 1980). In the case of hyperactivity, the dog receiving an oral dose of dextroamphetamine (0.2 mg/kg) or methylphenidate (0.2 mg/kg up to 1 mg/kg for an aggressive dog) will calm down, and its heart rate (HR) and respiratory rate will decrease by at least 15% from initial basal rates (Campbell 1973, 1992; Luesher 1993). This “paradoxical” effect of CNS stimulants is observed 30-90 minutes post-administration of the medication. The primary purpose of this explorative study was to measure the effects of dextroamphetamine on cardiac frequency, motor activity, as well as document associated general behavior changes in Beagles. The reliability of a collar mounted accelerometer as an objective measure of motor activity was also investigated.

## **Material and Methods**

A total of 12 entire dogs, 6 males and 6 females, belonging to the dog colony of the Veterinary School, and ranging in age from 13 to 20 months were used for the study. The beagle dogs were observed prior to the study and physical exam and behavior observation were within normal limits. Each dog was placed individually in a room for 90 minutes, to be video-recorded. Heart rate (HR) and gross motor activity were followed using a Polar® heart monitor and an Actical®. Dogs were randomly allocated to dextroamphetamine (0.2mg/kg) or placebo treatment. Following administration of the treatment, dogs were again recorded by video, Polar® and Actical® software. Each dog received each treatment at a 10 day interval based on the estimated wash-out period for dextroamphetamine in dogs. Data were recorded for each dog during a total of three hours per treatment. The video-recorded behaviors were compiled using The Observer® (Noldus).

## **Conclusion**

Although not all results are finalized at this time, the preliminary results seem to indicate that administration of dextroamphetamine may not be a reliable indicator of “hyperkinesis”. The collar-mounted accelerometer was found to be a reliable and repeatable method to measure motor activity in the dog.

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## **Keywords**

Activity, dextroamphetamine, dog; heart rate, hyperactivity, hyperkinesis

# Evaluation of Catnip and Feline Facial Pheromone Odor on Behavior of Domestic Cats in a Research Colony

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E. Rajapaksha,\* L. Lyons, E. Mintline,  
Veterinary Medical Teaching Hospital,  
University of California, Davis 95616, USA  
\*Corresponding author: earajaksha@ucdavis.edu

This study was designed to evaluate the behavioral responses of cats towards the odors of catnip and feline facial pheromone (FFP) and to assess the potential application of these odors as a method of olfactory enrichment. Fifteen cats were presented with an unscented piece of gauze as a control and then tested with the catnip spray, FFP spray and catnip leaves on a similar gauze. They were tested for 30 minutes, twice daily on three consecutive days for each treatment with a two day interval between treatments. Thirty minute video recordings were done for each session and they were scanned every five seconds using an ethogram. Regardless of the treatment, all cats approached and sniffed the gauze during the study. Response to catnip was observed in ten cats and these cats also responded to FFP. Comparison of the treatments showed a significant decrease in resting ( $p < 0.0018$ ), increase in grooming ( $p < 0.00276$ ) and increase in walking ( $p < 0.0125$ ) behaviors. Significant differences were observed for control vs. FFP spray and control vs. shredded catnip leaves. There was a significant increase in the response to catnip leaves when compared to the catnip spray and the FFP. Initial analysis of the study revealed that both catnip and FFP odors were effective in improving the activity level among the cats indicating the potential of these odors as enrichment agents in domestic cats. Similarities in olfactory response to both catnip and FFP indicated that the same mechanism may be involved in the behavior response.

## **Keywords:**

Behavior, cat, catnip, feline facial pheromone

# How I Treat: Night Waking in Senior Dogs and Cats

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Gary Landsberg

North Toronto Animal Clinic, Thornhill, ON, Canada, L3T 2K9  
gmlandvm@aol.com

Pets might wake their owners at night at any age, but this seems to be a particularly common and serious complaint for many owners of senior pets. Since treatment will need to focus on the particular patient and environment, the veterinarian plays a critical role in helping owners to improve or resolve these problems. Some in fact, may be particularly refractory to treatment.

Medical causes including cognitive dysfunction (CDS) must first be considered and ruled out. In fact, CDS alone can lead to increased agitation and altered sleep-wake cycles. In addition, senior pets may have multiple concurrent medical conditions, may be more resistant to the effects of environmental changes and more sensitive to the effects of stress.

Virtually any medical condition can affect behavior. History, physical examination and diagnostic testing are important for both screening and diagnosis. Any disease affecting the CNS whether intracranial (e.g. CDS, tumors, infectious agents, circulatory) or extracranial (e.g. metabolic, endocrine and any disease condition affecting CNS circulation including hypertension and anemia) must be ruled out. However, sensory decline, pain, drug therapy, endocrine disorders, metabolic disorders and any disease affecting urine or bowel control and frequency can also contribute to anxiety, poor quality night time sleep, increased daytime sleep or night waking.

In addition to the treatment of underlying medical problems, behavior therapy in the form of environmental enrichment and reinforcement of desirable behaviors, as well as environmental management are important components in helping the pets return to a more acceptable day / night schedule. Often, depending on the pet, the household and the problem, drugs may be a temporary or permanent component of the problem. Drugs and natural supplements for the treatment of cognitive dysfunction and anxiety disorders, as well as drugs and natural supplements that might help increase daytime alertness and increase night time sleep will be reviewed

The purpose of this HIT is also designed to generate additional discussion and input on diagnostics and treatment plans from attendees with experience in these cases.

# **How I Treat: Hidden Skills of a Behaviorist That Can Help Other Specialty Services**

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E.D. Levine

Animal & Emergency Referral Associates, Fairfield, NJ 07004  
elevine@animalerc.com

Since its inception, Veterinary Behavior has been mainly a reactive field, treating animals that are exhibiting problem behaviors. Steps have been taken to make the veterinary community more aware of the proactive/preventative aspects of behavioral medicine, primarily through early intervention in puppy and kitten classes and post-adoption counseling for shelter dogs. This HIT presentation focuses on newer aspects of preventative behavioral medicine; the integration of veterinary behavior with other specialty services to prevent complications in on going care of surgical patients. The initial steps in developing a coordinated post-op care paradigm using a behaviorist's skills in maximizing client compliance and the integration of this service within the hospital will be presented.



# How I Treat: Navigating the Personal and Emotional Aspects of Behavioral Consultations

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C.L. Pachel

Twin Cities Veterinary Behavior Referral Service, LLC

PO Pox 1059, White Bear Lake, MN 55110

drpachel@tcvetbehavior.com

Effective client communication is a critical component of a successful treatment plan for a behavior problem but client perceptions, emotional states or past experiences often influence that communication process. This presentation will focus on presenting case based examples of specific obstacles to client compliance or comprehension; identification of issues as well as the associated solutions will be covered.

Specific examples may include:

- Questions used to understand client's understanding of "leadership" and how the treatment recommendation was rephrased to connect with client's perception and lead to clinical improvement of anxiety condition.
- Identification of family dynamic issues related to expectations for young children and their involvement in the treatment plan (canine aggression directed at family members, specifically at young son).
- Addressing quality of life concerns for dog with severe panic episodes associated with severe destruction and escape attempts; creating a treatment plan with scheduled assessment points and evaluation criteria that allowed client to participate in treatment.
- Understanding client reasons for keeping dog in home even though causing significant destruction; incorporating that information into treatment plan.
- Compulsive disorder triggered as displacement behavior for social conflict and lack of understanding of normal canine social needs; presentation of treatment plan in way that incorporated client perception of dog as "child" without alienating them from participating in treatment.

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# Posters

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# Scent Preferences In The Domestic Cat

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Jacqueline C. Neilson

Animal Behavior Clinic 809 SE Powell Blvd., Portland, OR 97202 USA  
abcjndvm@hevanet.com

## Abstract

Eighteen domestic cats were exposed to five scents (bleach, cedar, citrus, fish, floral) and a control (no added scent). The response of the cat to the scents was videotaped over the course of 30 seconds. The time (in seconds) that the cat spent engaged with the scent, neutral with the scent and avoiding the scent were measured and recorded. A subjective score for “liking or “disliking” the scent was given by the investigator. Scent was significant for Engaged ( $P=0.048$ ), the “Est Medians” clearly broke out Bleach, Control, and Fish into the high scoring group. Scent was not significant for Avoidance ( $P= 0.243$ ) or Neutral ( $P=0.339$ ) behaviors. The Subjective response was significant ( $P = 0.019$ ); Control and Bleach split out from the other scents as being the most “liked”.

## Introduction

Olfaction serves an important role in many feline endeavors including feeding, social interactions and territorial delineation. The feline olfactory system has been shown to be more sensitive than that of the human. In households, felines are exposed to an array of scents in the forms of cleansers, candles, air fresheners, etc. Scents are added to feline products such as litter and deterrent sprays. These scents may or may not be pleasing to the cat. The purpose of this study is to evaluate the behavioral response of the domestic cat to a variety of scents so that veterinarians can advise owners as to feline preferred scents if the owner is using scented products in their home.

## Materials and Methods

Eighteen adult cats individually housed in kennels in a shelter setting were the study subjects. The cats were exposed to five different scents (bleach, cedar, citrus, fish, floral) and a control (no scent) in a randomized but controlled manner: 0.1 ml of scent was placed on a fragrance strip and the fragrance strip inserted into a plastic hair roller. With the kennel door closed, the investigator introduced plastic hair roller using 24” pick up tongs. The roller was placed approximately 3 inches from the cat’s nose and held in that position for 30 seconds while the cat was videotaped. This same process was repeated for the all scent options. The order of scent exposure was randomized and each cat was given at least a 10-minute break between each scent exposure.

The videotapes were reviewed by a veterinary behaviorist who was blinded as to the scent. The time that the cat spent engaged with the scent, neutral to the scent and avoiding the scent was measured and recorded. The behaviorist also gave a global subjective score to each cat for each scent on a nine point scale ranging from “likes extremely” to “dislikes extremely”.

## Results

Five cats were removed from the analysis; three cats were removed because the cat was obscured in some of the video footage and the investigator was unable to assess behavior. Two other cats were removed because they repeatedly had an extremely fearful/aggressive reaction to the introduction of the roller into the kennel. Therefore data collected on 13 cats was used in the final analysis.

For each response (engaged, neutral or avoidance) the Friedman Test, a nonparametric analysis of variance for a randomized block design, was performed. Also Estimated Median (Est Median) responses for each scent were calculated. Scent was significant for Engaged ( $P=0.048$ ), the “Est Medians” clearly broke out Bleach, Control, and Fish into the high scoring group. Scent was not significant for Avoidance ( $P= 0.243$ ) or Neutral ( $P=0.339$ ). The Subjective response was significant ( $P = 0.019$ ). Control and Bleach split out from the other scents as being the most “liked”.

## Discussion

A previous pilot study (Neilson, 2007) with seven feline subjects investigating six scents (citrus, floral #1, floral #2, fish, cedar, fecal malodor) showed a tendency for cats to be engaged with fish, cedar and control and to avoid citrus and floral #1, however the results were not significant. The current study deleted some of the original scents (fecal malodor, floral#1), added a new scent of interest (bleach), increased the number of cats and made some minor alterations to the methodology.

The cats in this study were more engaged with bleach, control and fish scents, suggesting that they prefer these scents over the other scents presented. And while scent was not significant for avoidance, citrus was the highest scoring in this category, suggesting citrus may be a deterrent for cats. This may be important when considering the use of scented materials in the home, especially when they are cat products such as litter. A recent trend in some scented cat litters is the addition of citrus based scents such as lemongrass. While there is conflicting data on scented litter being a factor for inappropriate elimination (Horwitz 1997, Sung 2006), the type of scent may be important and based upon this data, citrus scented litters may

not be the wisest cat litter purchase.

Despite attempts to minimize confounding factors, this study still had many challenges that may have impacted the results. The study was conducted in a shelter setting during operational hours. Therefore, there was shelter activity that may have created external distractions and impacted the cat's response to the scent. In addition, each cat was enclosed in a standard kennel during exposure to the scents, thereby somewhat limiting their ability to retreat. The control (no added scent) was not scentless since there was a plastic hair roller that has its own odor/scent. The cat may have been engaging with the introduced object (roller) and not the scent and this engagement level may have modified with repeated exposures with either a loss of interest or an increase in interest. An order effect also may have influenced results- scent exposures subsequent to an unpleasant scent exposure may have been prone to avoidance/neutral behavior from the cat. The scents were introduced in a random order and separated in time to try to minimize this effect, but it still could have impacted study results. And while the investigator tried to objectify the cat's behavior by measuring three different states (avoid, neutral, engaged), cats can be very subtle in some behaviors and subtle behaviors may have been missed. The study did not test for different intensity levels of the same scent thereby perhaps missing an optimal scent intensity the scents. The attraction/repulsion to certain scents may not have been driven by the scent itself but to other aromatic properties.

There is clearly a need for additional work in this area of feline olfaction, especially considering that scents are commonly used in household items including cat specific products. Hopefully, cats' preferences will be taken into consideration in product development to maximize cat comfort and minimize problematic cat behavior.

### **Acknowledgements**

The author would like to thank Clorox® for study sponsorship and statistical support and the Oregon Humane Society for the use of their facilities and cats.

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**Key Words**

cat, feline, olfaction, scent

# Is Bigger Better?

## Litterbox Size Preference Test

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Jacqueline C. Neilson

Animal Behavior Clinic 809 SE Powell Blvd., Portland, OR 97202 USA  
abcjndvm@hevanet.com

### Abstract

In order to determine litterbox size preference, 32 cats housed in four colony rooms in a shelter were given three litterboxes equal in every parameter except box size for a 21-hour test period. Excrement deposited in the boxes was collected, counted, weighed and recorded. Both parametric (ANOVA) and non-parametric (Friedman) tests were run on the data blocking by room. Although statistical significance was not achieved, the trend was that the large boxes were preferred over the medium and small boxes for the number of deposits and total weight of excrement.

### Introduction

It has been hypothesized that one cause of feline inappropriate elimination is a litterbox aversion secondary to small box size. Some experts recommend that litterboxes should be 1.5 times the body length of the cat. However, to the author's knowledge, there is a lack of evidence to support this claim aside from anecdotal reports and common sense. The purpose of this study was to identify if cats have a preference for a certain box size when all other variables are equal.

### Materials and Methods

Twelve uncovered, plastic, mauve-colored litterboxes were purchased from a major retail store. Three sizes of boxes were purchased: four small boxes (14"x10"x3.5"); four medium boxes (18"x15"x5") and four large boxes (22"x16"x6.5"). One-hundred and fifty pounds of Fresh Step Free® clumping litter was purchased for use in the study and each box was filled with litter to a depth of 2 inches.

Four colony rooms in a shelter setting housing approximately eight cats per colony room were used for this study. All standard shelter provided litterboxes were removed from the colony rooms and three test boxes (one small, one medium, one large) were introduced into each colony room and placed at the typical litterbox location separated from each other by a few inches. Every two hours during the course of the day (9 am -5 pm), the excrement was removed from the boxes via scooping, the number of depositions estimated/recorded and the excrement was

weighed and recorded. The box location was rotated one position clockwise every two hours at the time of excrement collection. At each scooping, the depth of litter was measured and if it fell below 1.5” new litter was to be added to bring depth up to 2”, however this was not necessary during the course of the study.

The final phase of the study involved the overnight period – a 12-hour test period. The cats had access to the three boxes overnight. At approximately 6 am (12 hours after the last scooping) the investigator performed a final scoop and estimated the number of depositions in each box and then weighed/recorded the excrement.

## Results

Table 1 includes the data for number of grams of excrement and estimated deposits in each sized box. It is evident that the large box had the most usage over the entire 21-hour test period. However, if the data collected during the daytime hours (when excrement was being removed every two hours from the boxes) is considered alone, their values are much closer for all box sizes.

**Table 1: Grams of excrement and estimated number of deposits in the boxes**

	Total # of grams of excrement (entire study period)	Estimated total # of deposits (urine and feces)	Grams of excrement in boxes during first 8 hours of study (scooping q 2 hours)
Small Box	1278	24	561
Medium Box	1586	40	416
Large Box	2429	44	727

Both parametric (ANOVA) and non-parametric (Friedman) tests were performed on the data blocking by room. Room 1 had results that were inconsistent with the other three rooms in which the large box was preferred for deposits and total excrement weight. There is an indication of a treatment effect when Room 1 is omitted from the analysis with the large box being preferred when total excrement (ANOVA  $p = 0.065$ , Friedman  $p=0.097$ ) and number of deposits (ANOVA  $p=0.093$ ; Friedman  $p=0.097$ ).

## Discussion

While trends were evident for preference of the large box, this study did not definitely demonstrate that large boxes were preferred by the cats in the study.



This study used the weight of the excrement and the estimated number of deposits as the measures of box usage. Weight of excrement, while relatively simple and inexpensive to do, is a relatively crude measurement of box usage. For example, one large urination by a big cat could equal the weight of three smaller urinations by petite cats. By also collecting the number of deposits there was an attempt to verify that weight was a reasonable measure and, in fact, the weight of excrement correlated with number of deposits. It is important to note that the number of deposits were estimates as occasionally they were difficult to assess due to clump breakage or scattering of fecal deposits.

One important factor that may have impacted the cat's choice of box size is the relative "soiling" of smaller sized boxes when compared to larger sized boxes. Since smaller boxes have less litter surface available and less litter, when a deposit is made in the smaller box, it becomes relatively more "soiled" than a larger box with the same size of deposit. To try to minimize this "soiling" effect on box selection in this study, the boxes were scooped frequently during the first part (daytime) of the study. And as is evidenced by the numbers, there was less of an effect of box size during this period. During the overnight period when the boxes were not scooped, the large box got the most usage. So perhaps the reason cats prefer the larger size box is related to the amount of relative box "soiling" and not due to the actual box size. Of course in a typical home, owners are not scooping the litterbox every two hours so a large box may be beneficial.

Other reasons that cats may prefer larger boxes would include ease of movement and ability to perform species typical elimination behaviors (digging/covering) without difficulty. Due to practical limitations, this study did not capture and measure the behavior of the cats when in the box. Other studies (Sung, 2007) have demonstrated that cats without elimination problems spend more time in the box and digging in litter when compared to cats with elimination problems. Therefore it may be important to assess if the cats spent longer periods of time in the large box, implicating that they may have a protective effect against house-soiling.

This study did also not take into consideration the musculoskeletal health of the cats. While the mean weight of the cats in each room was very similar (8.4 lbs, 8.6 lbs, 8.6 lbs, 8.9 lbs), arthritis could affect box choice. While none of the cats demonstrated overt signs of musculoskeletal pain, it is possible that some cats were attracted to the small box due to its shorter sides and therefore easier accessibility. On the other hand an argument could be made that cats with arthritis may prefer a larger box due to the larger area and therefore easier mobility/positioning

when inside the box.

Although this study did not establish a definitive preference for larger boxes, a trend for a larger sized box preference existed. Therefore until other data is presented that refutes these findings or there is a special needs cat that requires low box edges, the large sized boxes should be recommended for cat owners.

### **Acknowledgements**

The author would like to thank Clorox® for study sponsorship and statistical support and the Oregon Humane Society for the use of their facilities and cats.

### **References**

Sung W., Crowell-Davis SL., 2006 Elimination behaviors patterns of domestic cats with and without elimination behavior problems. *American Journal of Veterinary Research* 67 (9): 1500-1504.

### **Key Words**

elimination, feline, litterbox

# Carbamazepine for the Treatment of Canine Aggression: Seven Case Studies

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G.R.Carter\*

Behavior Service, Veterinary Clinical Sciences,  
Purdue University, Indiana, USA 47906.

\*Corresponding author: [gcarter@purdue.edu](mailto:gcarter@purdue.edu)

## Abstract

Carbamazepine is a tricyclic compound structurally similar to imipramine, and has variously been described as an anti-convulsant, a mood stabilizer, and an anti-depressant. Carbamazepine is the drug of choice in human patients with aggressive behavior related to epilepsy, but is also indicated for explosive aggressive outbursts, and aggression associated with agitation, irritability, anxiety, and impulsivity. Carbamazepine has also been used to reduce aggression in cats, and in a dog with psychomotor seizure. It is far from clear how carbamazepine asserts an anti-aggressive effect, however, it has been suggested that anticonvulsants have non-specific anti-aggressive effects mediated by stabilization of neural activity in the limbic system. Carbamazepine also impacts on various neurotransmitter systems, and lowers serum thyroid hormone levels. It induces its own enzymatic metabolism, resulting in an extremely short elimination half life in dogs. However, therapeutic benefit may be facilitated by a metabolite, rather than the parent compound. Seven cases of canine aggression are reviewed. Case selection was based on the use of carbamazepine in the treatment regime, and any diagnostic category of aggression. The owner's report on the patient's aggressive behavior before and after the addition of carbamazepine to the treatment regime are detailed. All dogs had initially received behavior modification and six had received medication with fluoxetine, with mild to moderate, or transient improvement in aggression. Six cases demonstrated a further reduction in aggression after the addition of carbamazepine, suggesting it may be efficacious as an adjunct to therapy, in the treatment of aggression in some canine patients.

## Keywords

aggression, carbamazepine, dog.

# Retrospective Evaluation of the Effects of Diazepam In Dogs With Anxiety-Related Behavior Problems

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M.E. Herron,\* F.S. Shofer, and I.R. Reisner  
Dept. of Clinical Studies – Philadelphia, School of Veterinary Medicine,  
University of Pennsylvania, 3900 Delancey St., Philadelphia, PA 19104-6010,  
Corresponding author: mherron@vet.upenn.edu

## Introduction

The purpose of this study was to characterize the effects of diazepam in dogs and to determine whether the described effects were bothersome enough to owners that they resulted in discontinuation of the medication.

## Materials and Methods

Owners of 37 dogs who had been prescribed diazepam by a behavior service over a 2 year period were surveyed by telephone regarding diazepam dose and frequency of administration, effectiveness, side effects, and, when applicable, reasons for discontinuing the drug.

## Results

Diazepam was described as “very” (24%) or “somewhat” effective (45%) by most owners. At the time of the interview, 18 owners (49%) reported that they were still administering diazepam to their dogs. For the remainder, reasons for discontinuation included undesirable side effects (58%) and lack of efficacy (53%). Reported side effects included sedation, increased appetite, ataxia, agitation, increased activity and aggression. Owners of dogs whose primary prescribed indication was thunderstorm fear (24%) were more likely to view diazepam as effective compared to owners of dogs for whom it was prescribed primarily for separation anxiety (54%) ( $p=0.011$ ). Owners administering a dose of diazepam  $> 0.8$  mg/kg were more likely to report increased activity as a side effect than those who gave their pets  $< 0.8$ mg/kg ( $p=0.03$ ).

## Discussion

Undesirable side effects of diazepam administration were common. The reported side effects led to drug discontinuation in some cases. These results highlight the importance of owner education and close follow-up in order to avoid treatment failure when prescribing diazepam for anxiety-related behavior problems.

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**Keywords**

anxiety, diazepam, dog

# Mitigation of Sow Aggression During Group Formation for Pen Gestation

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C. N. Ellis\* and T.D. Parsons

Department of Clinical Studies-NBC, School of Veterinary Medicine,  
University of Pennsylvania, 382 W. Street Rd. Kennett Square, PA

\*Corresponding author: [carrie@vet.upenn.edu](mailto:carrie@vet.upenn.edu)

## Abstract

Aggression in sows arising in pen gestation during the establishment of the social hierarchy can lead to scratches, wounds, lameness, and reproductive failure. The goal of this study was to characterize the aggression between sows during group formation on farms utilizing pen gestation. Animals were observed at two farms where sows were fed via electronic sow feeders and housed in dynamic groups immediately post-breeding, but utilized different genetics and pen layouts.

On farm #1, sows were introduced as a single batch into a pen with a capacity of ~55 sows. Newly introduced sows comprised ~25 per cent of the group. On farm #2, sows were introduced one at a time through the electronic sow feeder into a pen with a capacity of ~170 sows. Newly introduced sows here comprised ~10 per cent of the group. Sows on farm #1 were three times more likely to engage in retaliation when the interaction was between newly introduced animals as greater than 75 per cent of these interactions resulted in a fight. On farm #2, sows were also more likely to fight when the interaction was between new animals; however, less than 33 per cent of these interactions between new animals elicited retaliation, suggesting significant between farm differences in sow aggression at group formation.

Pen size, method of entry and genetics may all play a role in reducing the incidence of aggression between sows at group formation for pen gestation. Further studies are needed to define the relative importance of these different management tools to mitigate any untoward effects of group housing.

## Introduction

Both market and legislative forces have motivated U.S. swine producers to consider alternatives to the gestation stall. One major challenge faced by farmers working with pen gestation is managing the social hierarchy that naturally forms when pigs are housed in groups. With the constant turnover of sows in a dynamic group, the social hierarchy needs to be re-established each time new animals are added to

the group and thus the possibility for reoccurring bouts of aggression exists (Simmins 1993).

Aggression that arises during the establishment of the social hierarchy can lead to scratches, wounds, lameness or other injuries that if sufficiently severe could result in the sow being culled from the herd. Furthermore, if sow mixing and group formation is allowed to happen during implantation of the embryos (between 7 and 28 days post-mating), the risk of increased reproductive failure can potentially be increased.

Jensen studied sow interaction patterns and defined some patterns as aggressive such as parallel pressing and inverse parallel pressing, when they were avoidable and not influenced by space limitations (Jensen 1980). Anil et al (2006) also described head-to-head knocking, levering, and biting as agonistic behaviors. The goal of this research project was to characterize the aggression between sows during group formation on farms utilizing pen gestation.

### **Material and Methods**

Animals were observed at two farms where sows were fed via electronic sow feeders (Schauer Compident IV, Prambachkirchen, Austria) and housed in dynamic groups immediately post-breeding. At farm #1, observed animals were housed in a pen of ~56 animals with ~24 sq ft per sow. On this farm ~14 sows were introduced to the pen every two weeks in a batch. Sows observed at farm #2 were housed in a pen of ~170 animals with ~25 sq ft per sow. Here about ~18 sows were introduced to the pen every two weeks, one at a time via the feed station. At each farm, subgroups of sows were observed for up to two hours upon movement into gestation pens.

Interactions were noted between sows that were already in the gestation pen (Old) and sows being entered into the pen (New). Sow behaviors were determined to be aggressive based on the studies done by Jensen (1980). Each interaction was classified based the reaction of the aggressed sow-either withdrawal or retaliation. A chi square test was used to analyze the data for significance.

### **Results**

Sows on farm #1 were 3 times more likely to engage in retaliation when the interaction was between newly introduced animals, as greater than 75% of these interactions resulted in a fight. On farm #2, sows also were more likely to fight when the interaction was between new animals; however, less than 33% of these interactions between new animals elicited retaliation. These data are summarized in table 1.

**Table 1: Observed Interactions Between Sows During Group Formation**

	New/Old Interactions			New/New Interactions			
	Retaliation	Withdrawal	Total		Retaliation	Withdrawal	Total
Farm 1	15.3	3.6	6.2	duration (s)	86.1	3.5	68.7
	5.1	0.8	1.6	sem (s)	34.5	0.9	28.2
	8 <sup>a</sup>	23 <sup>a</sup>	31	# observations	15 <sup>b</sup>	4 <sup>b</sup>	19
	25.8%			% retaliation	78.9%		
Farm 2	26.0	5.8	8.8	duration (s)	39.8	11.4	20.6
	4.8	1.0	1.4	sem (s)	11.1	2.3	4.3
	10 <sup>a</sup>	58 <sup>a</sup>	68	# observations	15 <sup>b</sup>	31 <sup>b</sup>	46
	14.7%			% retaliation	32.6%		
Total	18 <sup>c</sup>	81 <sup>c</sup>	99	# observations	30 <sup>c</sup>	35 <sup>c</sup>	65

*Values with common superscripts are significantly different at  $p < 0.01$ .*

## Discussion

The data summarized in table 1 indicate that there is increased aggression and retaliation between newly mixed sows compared to sows already in the pen. If the fighting is occurring mostly between new sows and is not involving the old sows, there is less of a concern that adding sows in a dynamic group setting will interfere with the implantation phase of gestation in the old sows.

There are also significant differences in the amount of aggression between farms for both new-new and new-old interactions. Farm specific factors that might play a role include pen design (size, shape and number of feeders) and methods of introducing sows to the group (batch vs. one at a time via the ESF station). Sow genetics also differed between the two farms. Further studies are needed to define the relative importance of these different management tools to mitigate any untoward effects of group housing.

Since mixing sows is often unavoidable, it is important to determine ways to make the transition as least stressful for the sows and to reduce aggression as much as possible. Anil et al. offers some suggestions for adding sows in a dynamic group setting. These suggestions include providing materials such as straw to divert the attention of the sows during mixing and to reduce hunger as well as pre-exposure of sows by maintaining subgroups in adjacent pens to reduce aggression at mixing (Anil et al 2006). Our studies suggest that pen design, sow genetics, and how sows are introduced to the group may also be critical factors in mitigating sow aggression in group housing.



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### **Keywords:**

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