

*Current Issues  
and Research in  
Veterinary  
Behavioral Medicine*

Papers Presented at the 5th International  
Veterinary Behavior Meeting

Editors:

Daniel Mills, Emily Levine, Gary Landsberg,  
Debra Horwitz, Margaret Duxbury, Petra  
Mertens, Kathy Meyer, Lisa Radosta Huntley,  
Marsha Reich, and Janice Willard

Purdue University Press

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To R. K. Anderson,

A man who has led so many of us and our patients to exhibit better behaviour in the most gentle of ways.



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## Preface

It is sometimes said that committees of more than seven are less efficient than individuals, but the Fifth International Veterinary Behavior Meeting would never have succeeded if it was down to the efforts of a single individual or even a small committee. It is testament to the exceptional team work of individuals within many committees and their skillful management and leadership that we are able to produce this latest volume. We are indebted to everyone who has helped in whatever way to make this meeting a success and helped these biennial meetings grow each time. The seeds for the Fifth International Veterinary Behavior Meeting grew out of the excitement and momentum generated by the 4th IVBM in Caloundra Australia. The gathering of scientists, veterinarians and practitioners of applied animal behavior from all over the world is an exhilarating event that all wish to see continued.

The overall organizing committee of Gary Landsberg, Debbie Horwitz, Daniel Mills, Kersti Seksel, Petra Mertens, John Ciribassi, Sarah Heath and Andrew Luescher has worked tirelessly to secure funding, hotel space, set up registration and a million other details that must be addressed, in order for this meeting to happen. The registration committee of Debbie Horwitz, Gary Landsberg, Jacqui Neilson and Melissa Bain (AVSAB) has worked to iron out all the attendance details. Petra Mertens, Margaret Duxbury and colleagues have worked as a local liaison committee to make sure our needs are met on the day, with Gerry Flannigan, Petra Mertens, Kelly Moffat and Sagi Denenberg providing support for presenters. In addition this meeting would not have been possible without the assistance of the American Veterinary Medical Association, as well as the cooperative efforts of the American Veterinary Society of Animal Behavior and the American College of Veterinary Behaviorists who have joined forces to make this a collaborative effort.

Each international meeting has as the high point the paper presentations. Daniel Mills, Emily Levine and their committee worked hard to insure the impartial selection and review of papers. Each paper was reviewed by at least four reviewers, who declined to review any paper they had an interest in at any level. Laurie Bergman, Kathe Houpt, Andrew Luescher, Petra Mertens, Patrick Pageat, Marsha Reich, Ilana Reisner and, Kersti Seksel read the blinded papers and ranked them. The programme was then generated on the basis of a consensus on merit and diversity. With over one hundred submissions to the review panel, we decided in the interests of



maintaining the diversity that is characteristic of these meetings to limit presenters to a maximum of a single spoken presentation. Even with the meeting spread over three full days, some who wished for spoken papers have been asked to create posters instead. All are included in this volume and are equally deserving of attention. Margaret Duxbury, Debbie Horwitz, Gary Landsberg, Emily Levine, Petra Mertens, Kathy Meyer, Danny Mills, Lisa Radosta-Huntley, Marsha Reich and Janice Willard have edited the papers for the proceedings. We have given support to those for whom English (or American!) is not their first language and who requested such help. We are particularly grateful to these presenters for submitting their work, as presenting and communicating science can be daunting enough without the added barrier of a different language. We have maintained both North American and European English spelling throughout as we believe this is not a barrier to communication, but in places we have needed to edit language. Wherever possible we have consulted the authors for confirmation of changes, but cannot be held responsible for the consequences of the application of the information contained in this volume. We strongly urge readers to consult the corresponding author for further information wherever relevant.

A venture such as this cannot take place without the generous support of the veterinary business community. Once again we have been able to secure sponsorship to ensure a wonderful meeting that will provide not only scholarship, but also meals and opportunities for socializing as well. Thank you to the following for their generous sponsorship. At the time of going to press our sponsors are:

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A special thank-you to the committee of Debbie Horwitz, Shelley Breadner, John Ciribassi, Patrick Pageat, Kersti Seksel, Rolan Tripp, Sagi Denenberg and Sarah Health who have worked to not only secure the funding but make sure our sponsors are recognized and appreciated. Melissa Bain, John Ciribassi and Lisa Radosta-Huntley have been central to ensuring that the cheques arrive and go in to the right account.

But the success of these meetings is not just down to the various organizational committees and sponsors though, it depends on the contributing authors and the engagement of delegates. These events have always aimed at being dynamic educational events for all participants where ideas are exchanged and developed in a supportive and convivial environment. This volume illustrates the diversity of ongoing research in the field and the importance that all have to play in this fledgling discipline. We have presenters from across the globe, from veterinarians and non-veterinarians, from graduates and students, from practitioners and academics; all making a contribution to improve our knowledge base. Some will help refine or confirm our current opinions, others enlighten us, and some, we hope, challenge us. The original aim of these meetings was to try to increase the appreciation and understanding of the different approaches used internationally within the discipline and this has undoubtedly happened over the last eight years. Perhaps, now we are moving into a new phase, where the aim is to test these ideas more empirically, present the results and pause to reflect.

This meeting has been a true transatlantic marathon, with frequent phone calls and meetings between the four of us, whenever we can manage it or the situation demanded. We are still not entirely sure how one resident American, a Brit, an American based in England and a Canadian, all ended up in the driving seat together, but we know each other a lot better as a result! To anyone we have forgotten to mention, we apologize. Finally, the time we have diverted to this project would have only been possible with the support of our families and colleagues at work. Thank you. We owe you all, so much.

Daniel Mills  
Debbie Horwitz  
Emily Levine  
Gary Landsberg

*May 2005*



# **The Introduction of a Female Tiger (*Panthera tigris*) in a Pre-established Group of Two Neutered Males: A Case Study**

***E. Gaultier\*, C. Falewée, L. Bougrat, P. Pageat***

## ***Introduction***

Following a modernization of the cage plan, the zoological garden staff of La Barben (France) needed to introduce a 15 year-old female tiger, Caroline (coming from an old model cage) into a modern one already inhabited by two 5 year-old neutered males, Pavlov and Pouchkine. The female (Sumatran sub-species) entered the zoo six years ago, coming from a circus. The two males (Siberian sub-species) were from the same litter and entered the zoo in their early years. These two neutered males used to live with their sister, Petrushka, before she was moved, as a part of the European Endangered Species Programs, to the Beekse Bergen Safari (Netherlands) in May 2004.

Tigers are solitary animals in the wild. To be housed in a group may be perceived as a stressful situation for these three subjects. Moreover, the new cage offered an unknown environment leading to a stressful situation for the female. The classical procedure for introducing a new felid into an inhabited park is to give long acting neuroleptics to every individual for about three weeks.

Knowing the age of the female tiger, and the neuroleptics' side effects on social behaviour in senior animals and also the impression on visitors by sedated wild animals, the zoo scientific manager decided to find a solution avoiding the use of sedative drugs during the period of adaptation and introduction. Facing these difficulties it had been decided to combine a multiple step introduction procedure, minimizing the stress at each step with pheromone therapy.

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*Phérosynthèse Research Center, Le Rieu Neuf, 84490 St Saturnin d'Apt, France*

\*Corresponding author: [emmanuel.gaultier@wanadoo.fr](mailto:emmanuel.gaultier@wanadoo.fr)

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## **Materials and Methods**

### **Pheromonotherapy**

The decision to use pheromones was based on two facts. First, previous successful experiences had been handled in this zoo using pheromones to reduce stress in various cases and species: travel of a maned wolf (*Chrysocyon brachyurous*) without sedative drugs using DAP<sup>®</sup>, introduction of a female Asian elephant in a park inhabited by a congener using the unspecific part of appeasing pheromones, and decreasing the stress of panthers during a transfer between two zoological parks using the cat appeasing pheromone (not on the market).

Secondly a previously published study conducted at Edinburgh zoo (Spielman 2000) showed a significant decreasing in spray-marking and head-rubbing behaviours in tigers during and after a Feliway<sup>®</sup> treatment.

Concerning the present case, we decided to use Feliway<sup>®</sup> in order to decrease the female's stress due to the new environment. Two devices had been plugged in the tigers building (where tigers are kept at night and where they can rest during the day). In addition, Felifriend<sup>®</sup> (cat allomarking facial pheromone used for the facilitation of a newcomer's acceptance) had been sprayed every day on each tiger's flanks.

### **Multiple steps introduction procedure**

This strategy combines both aspects of habituation and inter-cat aggression therapeutic program. Every source of stress had been listed and the procedure of introduction had been defined for the female to encounter one source of stress per step. This controlled exposure lasted until the tigers didn't show any sign of anxiety. Then, the next step was ready to begin. Typical behavioral signs of either fear or diminished welfare have been extrapolated from studies exploring anxiety in cats (Rochlitz et al. 1998, Gaultier et al. 2002). Tigers' behavior indoors has been videotaped for one hour the first day of every new step (except outdoor ones) and then regularly looking for the quoted behavioral signs.

Reducing fear and anxiety and increasing confidence of the "newcomer" are an important aspect of inter-cat aggression therapeutic program (Landsberg et al. 2003). Another important point is to provide sufficient hiding areas so as to give the newcomer the opportunity to prevent conflicts and display less anxiety. Last therapeutic process was to begin the introduction with isolating the tigers in confinement areas where they are unable to see and interact with each other.

### **Details of the different steps (defined before the introduction) follow:**

For the first step of the introduction procedure, the objective was to get the female used to the place where tigers are kept at night. This allowed her to encounter the two males, out of sight, but audible and present everywhere by their smell. The goal was to wait until this unusual situation would have no more consequence on their

habits (outside and inside the night place). During daytime, the two males could go outside but they still had the opportunity to have access to one lodge. During this time, the female could either stay in her night place or go in one lodge where a male stayed during the previous night and explore it. In this lodge, she could see outdoors through a trap door and so do the two males.

The second step consisted in getting the female used to going outside by herself in the morning and entering the stud at night, alternating with the two males. The aim was to be sure she could tolerate the new outdoor environment and master the routine of going outside and inside the stud. During this step, the first visual contact between the three tigers had to happen, to go outside, the female had to pass by the lodges of the two males.

The third step was about close contacts: the tigers were kept in nearby lodges then waited until no excessive reaction was observed.

The fourth step consisted in organizing outdoor confrontations between one male and the female.

The last step: outdoor confrontations between all three tigers.

One important condition of success for an inter-cat aggression therapeutic program is the time accorded to the procedure: success requires considerable patience (Landsberg et al. 2003). When the program began (at the end of autumn), there was no time obligation for the zoo staff. The only restriction was linked to visitors' presence: the two males had to be outside during weekends.

## **Results**

After each important environmental change the female showed signs of distress (arousal, panting, pacing) as it would have been expected, but the behavioral habits of the males were also disturbed: Pouchkine panted a lot (although the external temperature was around 32° F), he showed restlessness and hyperesthesia. He also showed more allomarking contacts with his brother. This repeated observation led us to think that his brother's contact helped him with facing stress. Aware of this fact, it had been decided to modify the last step of the introduction program: confrontation will be done directly between the two males and the female.

The other male, Pavlov, considered as the bravest by the keepers, showed less signs of fear and more exploration items toward the female. He was the first to enter regularly the lodge during the day in order to explore Caroline's night place. At the beginning of this step, the female fled and hid, but at the end she would stay on the ground, often growling but never fleeing anymore. From this moment, Pavlov emitted special sounds he used to do when he established a "pacifying" contact with his brother, toward Caroline. Pavlov had always shown signs of perfect self-control, although the female growled at him when this type of interaction happened, he just turned back and left quietly without insisting.

The first time Caroline went outside, she showed typical signs of hyperesthesia: she shied when surprised by the shadow of a flying bird. After 10 min of panting and moving with her body lowered, legs tucked under body, she explored the two males' favorite spraying locations, emitting a flehmen each time. In her previous little cage, Caroline used to pace a lot, and things didn't improve in this one. Keepers reported that her pacing episodes were more frequent and more intense at the beginning of each step and after a few days of accommodation, pacing still occurred, but less often and was expressed less intensely.

The day of the confrontation, the two males were already outside when the female went out. The bigger male, Pavlov, came around and Caroline immediately rolled to the side in a typical defensive position. As usual, this male showed a high level of calm and control and immediately stopped the interaction, climbing on an elevated location to keep an eye on the female. Pouchkine stayed away during this first interaction. This male and the female panted a lot and shied excessively, showing a great level of arousal. Pavlov never stopped observing the female; he tried, several times, to interact with her, emitting special sounds of "pacifying" contact. The female still growled at every attempt of contact but less and less violently and Pavlov had always respected this menace. When Caroline began to pace, Pavlov left his observation location and came to pace in the same area. The two tigers were thought to be pacing in a symmetrical way. It was the first time that the keepers observed this male pacing. After one hour, Caroline and Pouchkine stopped panting. During the afternoon, Caroline entered a lodge to rest. Pavlov came several times and explored the door but Caroline systematically growled. When the male finally entered the stud, there was no violent interaction. The female kept on growling and Pavlov took a quick look inside before quietly going out.

Now, three months after this first confrontation, keepers relate games and allomarking between Pavlov and Caroline. She has a greater appetite, paces less often and presents a more beautiful fur.

## **Discussion**

Three main topics arise from observations made during this study:

Many behavioral traits are similar between tigers and cats: scent-marking, strategy, typical signs of fear and signs of welfare, and a great variability between individuals.

Techniques used to prevent fear aggression and inter-cat aggression between cats in a household could be easily adapted to wild felines in zoological parks.

Even if it was a single experiment, the use of cats' pheromones in the management of stress in captive tigers seems to be helpful. Keepers were surprised to see such a fast disappearance of stress items within each step. We could hypothesize that a high concentrated solution of pheromone specific to one species should have an expected effect on a close genetic species.

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## Keywords

*pheromone, tiger, zoo*



# Treatment of Generalized Anxiety in a Cheetah (*Acinonyx jubatus*)

**L. Bergman\*, D. Janssen<sup>1</sup>**

A 10-year-old, single housed female cheetah (*Acinonyx jubatus*) presented increasingly fearful behaviour. The anxiety was seen in a variety of situations, including during feeding. The cheetah's keepers felt that the animal's level of anxiety would prevent them from training her to accept the restraint necessary to attempt breeding using assisted reproduction techniques.

A diagnosis of generalized anxiety was made. Treatment with fluoxetine (1mg/kg PO q. 24 hours) was begun. Although other psychotropic medications have been evaluated for short-term stress reduction in cheetahs, these drugs showed a high level of side effects that precluded their use for long-term treatment and would likely interfere with learning (Huber 2001). Once a reduction in anxiety while eating was seen, positive reinforcement training to enter a carrier and squeeze cage was begun. The cheetah responded very well to the training. When training was briefly suspended, the anxious behaviour returned, despite continued drug therapy. Once training resumed, the cheetah returned to a less anxious state. In addition to providing the first documented use of fluoxetine in this species, this case also illustrates the importance of combining behavior modification with psychotropic medications.

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\*University of California Veterinary Medical Center, San Diego Behavior Service, 6525 Calle del Nido PO Box 9115 Rancho Santa Fe, CA 92067, USA

<sup>1</sup>San Diego Wild Animal Park, 15500 San Pasqual Valley Rd., Escondido, CA 92027, USA

\*Corresponding author: lbergman@ucdavis.edu

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**Keywords**

*anxiety, cheetah, fear, fluoxetine*

# Using Multiple Correspondence Analysis to Define Groups of Dogs (*Canis familiaris*) at Risk for Aggressive Behaviour

N. C. Guy\*, J. Sanchez<sup>1</sup>, A. U. Luescher<sup>2</sup>

## Introduction

Multiple correspondence analysis (MCA) graphically represents the relationships between a number of variables. Much as a histogram can highlight the characteristics of a simple table of data, MCA can be used to detect patterns in more complex data sets. MCA is not useful for the confirmation or rejection of hypotheses, but is primarily intended to reveal features in the data (Greenacre and Blasius 1994). It will not, for example, quantify the effect of risk factors (Dohoo et al. 1996). In MCA there is no distinction between variables to be described and describing variables. Mathematically, MCA requires the construction of a matrix based on pairwise cross-tabulations of each variable. Using only categorical variables, the analysis produces a multi-dimensional cloud of points which is then projected onto a single plane for ease of interpretation. The plane that is selected will retain the greatest degree of variability (known as *inertia*) as possible from the data set.

The application of MCA was first developed in France, and has been most popular in the analysis of social science or ecological data (Greenacre and Blasius 1994). MCA has more recently been applied to epidemiologic studies, including such examples as the examination of patterns of clinical mastitis in cattle, the occurrence of respiratory disease outbreaks in pigs, and in following the course of disease

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\*Dept. of Biomedical Sciences and <sup>1</sup>Dept. of Health Management, Atlantic Veterinary College, University of Prince Edward Island, Charlottetown, PEI, C1A 4P3, Canada

<sup>2</sup>Dept. of Clinical Veterinary Science, Purdue University, West Lafayette, IN, 47907-1248, USA

\*Corresponding author: nguy@upeil.ca

in cats experimentally infected with different strains of the feline immunodeficiency virus (Vaarst and Enevoldsen 1997; Rose and Madec 2002; Monte et al. 2002).

In our previous analysis of a large data set, multiple logistic regression was applied to identify risk factors for biting behaviour by dogs toward household members (Guy et al. 2001). Based on the responses of dog owners to a telephone questionnaire, quantitative estimates of effect were obtained. For example, the odds of being eventually bitten by a dog were 3.08 times higher (95% CI: 1.05-9.01) if that dog had shown aggression over food in the first 2 months of ownership. This form of analysis is obviously useful, especially when risk factors are identified that will lead to successful forms of intervention. On the other hand, regression techniques assume independence among the independent variables. There may be problems if multicollinearity is present, such as when two independent variables are highly correlated (Dohoo et al. 1996). In the process of striving to build the most parsimonious regression model, it is possible that some clinically important information may be lost.

It is unlikely that any other specialty in veterinary medicine requires the collection of such a lengthy and detailed history as does behavioural practice. The clinical history has been described as the “heart” of companion animal behaviour diagnosis and therapy (Landsberg et al. 2003). Sometimes what an owner intended as only an offhand comment will enlighten the practitioner as to the true nature of the problem, leading to diagnosis and successful treatment. Under such circumstances, it can be important to retain as much detail as possible in any investigation. In this paper we have applied the technique of MCA to data which had previously been evaluated by multiple logistic regression, both with an academic interest in the potential usefulness of this technique and out of a clinical interest in its effect on our interpretation of the results. One of the goals was to determine whether this population of biting dogs could be grouped according to a combination of factors, with particular interest in fearfulness and the early onset of aggressive behaviour.

## ***Materials and Methods***

In a previously described survey, telephone interviewers collected information from 515 dog owners who were clients of general veterinary practitioners in 3 provinces in eastern Canada (Guy et al. 2001). This was a sub-population from a larger survey of 3,226 owners. The original questionnaire contained 140 questions, collecting general information on the dog, the home environment, and specific responses to a number of questions related to the behaviour of the dog and any aggression. From that population, 221 dogs were identified as having bitten people living in the same household. Biting was defined for the respondents as: “the upper or lower teeth making contact with the victim’s skin with sufficient pressure to cause a visible injury such as an indentation, welt, scrape, bruise, puncture, or tear in the skin. A dog mouthing a person’s skin without applying sudden pressure is not considered a

bite". For inclusion in this MCA model, variables were selected with the intention of minimizing multicollinearity and reducing recall bias. Variables included the dog's age when it bit for the first time, its gender and weight, and whether or not the owner considered the dog to be generally fearful. Three additional variables were included that were based on the owner's assessment of their dog's behaviour or temperament in the previous 2 months on a scale of 1 to 10, including the degree to which they thought the dog was shy versus outgoing, how aggressive they believed their dog to be, and to what degree they felt they could not trust their dog with children. As only categorical variables can be used in this technique, continuous variables such as weight, age at the time of the first bite incident, and the behavioural scores (ranging from 1 to 10) were dichotomized using logical cut-off points derived after careful examination of the distribution of responses to each question. Breed could not be included as one of the variables because the diverse nature of the population precluded any rational division of the dogs into a smaller number of groups. Reproductive status was not included because such a small proportion of the dogs in this study population were sexually intact. The final dichotomous variables were therefore gender (male or female), weight (small <20kg or large, 20kg), age when first bit (<24 months or 24 months), shy or outgoing in past 2 months (5 score classified as shy, >5 score classified as outgoing), level of aggressiveness in past 2 months (5 score classified as not aggressive, >5 score classified as aggressive), and lack of trustworthiness with children in the past 2 months (3 score classified as trusted with children, >3 classified as not trusted with children). The MCA technique was applied with the use of the STATA (version 8) statistical software package (Stata Corporation, College Station, TX, USA).

## **Results**

The results of the multiple correspondence analysis are shown in Figure 1. The MCA explained 99.7 percent of the complete variability in the data, using two axes. The first axis, which explained 93.6 percent of the variability, was defined by size, fearfulness, shyness, trustworthiness with children, aggressiveness, and age when the dog bit for the first time. The second axis, explaining 6.1 percent of the variability and independent of the first axis, was defined by the gender of the dog. The display demonstrates the structural relationship between the variables. For example, being outgoing, not fearful, and biting for the first time at an age of less than 24 months are strongly associated with each other, and all three of these variables are more closely associated with male dogs than female dogs. Small size is more closely associated with aggressiveness and the owner's belief that the dog is less trustworthy with children. The display indicates that there is a trend towards female dogs biting for the first time when older, and male dogs biting for the first time at less than 24 months of age. There is also a tendency for owners to consider their dog to be more trustworthy with children and non-aggressive if the dog is large (at least

20 kg) and female. Being classified as shy in the first two months of ownership or generally fearful in the two months prior to the survey does not appear to be associated with whether or not the dog is described as aggressive or non-aggressive.

Figure 1. Plot of the multiple correspondence analysis results.

The diagram represents the projection of a multidimensional cloud of points onto the plane retaining the most variability (inertia) from the data set. The horizontal and vertical lines denote the two axes of the data as described in the results. The distance between variables is a reflection of their association. More closely positioned variables are more strongly associated.

<p>not trusted</p> <p>male</p> <p>aggressive</p> <p>small</p>	<p>outgoing</p> <p>first bite &lt;24 months</p> <p>not fearful</p>
<p>first bite, 24 months</p> <p>fearful</p> <p>shy</p>	<p>large</p> <p>trusted</p> <p>female</p> <p>not aggressive</p>

## **Discussion**

The fact that this data was collected by telephone interviews with dog owners must be considered when interpreting these results. Such interviews provide an owner's interpretation or opinion of his or her pet's behaviour, not direct observations. The questions asked, and even the way they are asked, can have a significant effect on the accuracy of the information gathered. At the same time, however, our data should approximate the level of accuracy that is typically collected in the behavioural history when working up a clinical case. A recent publication by Dodman et al. (2005) supports the effectiveness of behavioural diagnosis by questionnaire, even in the absence of direct observation.

The results of this analysis suggest some interesting patterns in the behaviour of biting dogs. It's not surprising that dogs which are judged to be outgoing are also thought to be non-fearful, but the tight association of these two variables with a his-

tory of having bitten for the first time at a young age does raise some questions. It is our clinical impression that there exists a population of dogs who start biting before maturity, and that this behaviour is strongly linked to a fearful or anxious temperament (Luescher 2001). Our previous work with this data had indicated that forms of aggression which might involve possessive or self-protective motivations were more likely to be associated with the dog also being fearful of a variety of stimuli (Guy et al. 2001a). There may be another sub-group of dogs who are biting at a young age secondary to a high level of confidence and more intense physical interaction with owners.

Reisner et al. (1994) determined that aggressive dogs which were larger were more likely to be euthanized. Among the population of dogs who are maintained by their owners and not euthanized for their aggressive behaviour, it would appear that smaller size is actually associated with both more aggressive behaviour and less perceived trustworthiness with children. The MCA indicates that larger female dogs may be considered to be less of a threat to the family, confirming our previous finding by logistic regression that the risk of biting by female dogs decreased as their size increased (Guy et al. 2001a). We also found that owners were more likely to rank a bite incident as a serious event if the dog was male (Guy et al. 2001b), suggesting some difference in the owners' perception of the behaviour related to gender.

In multiple correspondence analysis, the need to categorize continuous variables may result in essentially arbitrary decisions being made about cut-off points, and this may affect the results (Dohoo et al. 1996). On the other hand, the abandonment of variables due to a lack of statistical significance, again at an arbitrarily chosen level (as occurs in logistic regression), may lead to an undesirable loss of useful information. MCA holds an appeal in that it has the familiarity of diagnosis by pattern recognition, an almost intuitive grasp of the nature of a problem derived from experience with similar cases. Pattern recognition has been defined as "*the instantaneous realization that the patient's presentation conforms to a previously learned picture (or pattern) of disease*" (Sackett et al. 1991). Although pattern recognition can sometimes lead to misdiagnosis, in everyday practice it is a useful behaviour that can influence the direction of diagnostic testing in an efficient way and expedite the treatment of many cases. Many of us in behavioural practice rely on pattern recognition daily, usually without being aware that we are doing so.

## **Conclusion**

Using this study population of dogs, all of whom already had a history of biting, our multiple correspondence analysis did not detect an obvious association between reported fearfulness and the owner's perception of the level of aggressiveness in their dog. Strong associations were displayed between other variables, particularly an outgoing and non-fearful temperament and reports of having bitten at less than 24 months of age. Although MCA does not provide a statistical measure of the level of

significance in associations between variables, it can help provide a revealing picture of data when used in a complimentary fashion with other statistical techniques.

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## Keywords

*aggression, correspondence analysis, dog*



# High Prevalence of Feline Aggression Cases Targeted Towards People in Japan

Y. Kakuma\*<sup>1</sup>, K. Uchida<sup>2</sup>, K. Kariya<sup>2</sup>

## Introduction

Behavioural problems in domestic cats (*Felis silvestris catus*) are treated less often than those in dogs in many countries including Japan, where veterinary behavioural medicine is relatively new. Whilst the number of the behavioural cases is rather small, we have noticed a high prevalence of aggression cases in cats, especially towards owners. In the UK and the United States, several statistics have shown that the most commonly reported behavioural problems in cats are those related to elimination, including urine spraying and house-training problems, and they may account for approximately half of all behavioural cases (Overall 1997). Aggression problems have been considered the second most common problem in cats in the Western countries and the half of the aggression cases are those directed to conspecifics. Only recent data by The Association of Pet Behaviour Counselors (APBC) showed more cases of aggression directed to humans rather than to other cats (Hoole 2003). Less attention and research into feline aggression, as compared to canine aggression, in clinical veterinary behaviour has resulted in the situation that available information on diagnosis and treatment is still limited. In this study, we reviewed the feline aggression cases which were presented to a private veterinary clinic in Japan for behavioural counseling. We examined the profiles and housing conditions of the cats, together with the types of aggression, interventions, and prognoses in order to identify the factors which may be associated with the development and treatment of feline aggression towards people.

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<sup>1</sup> Dept of Animal Sciences, Teikyo University of Science and Technology, 2525 Yatsusawa, Uenohara, Yamanashi 409-0193, Japan

<sup>2</sup> Kariya Small Animal Hospital, 2-6-14 Ichikawa, Ichikawa, Chiba 272-0034, Japan

\*Corresponding author: kakuma@ntu.ac.jp

## **Materials and Methods**

A total of twenty five cats were brought for consultation for their behavioural problems between November 2001 and October 2004. The behavioural counseling was carried out by a veterinary practitioner (KU) at a general veterinary hospital near Tokyo. Information on each cat and their owners was collected through questionnaires and interviews. The following general profiles of cats were collected; breed, sex (neutered or not), coat colour, body weight, age when obtained, source of cat, housing conditions (indoor/outdoor, moving, apartment/house), and people and other animals in the same household. The data on aggression of each cat collected were; age to become aggressive, triggering stimuli (if known), target(s) of attack, other behavioural problems, interventions for treatment (behavioural and environmental modifications, use of drugs, surgical procedures), and response (recurrence of severe attack). All these data were used for retrospective analyses.

## **Results**

The major complaint for 17 cats (68%) was severe aggression towards owners, whereas the other eight cats were brought for self mutilation (2), inappropriate scratching (2), inappropriate elimination (1), and excessive grooming (1).

Almost all owners of aggression cases claimed that their cats suddenly started violent attacks towards people, mainly owners. The cats were so excited or frightened that victims could not move or enter the room, and were severely injured in some cases. According to the descriptions given by owners, it was considered that at least ten cats were showing redirected or fear-related aggression and others were predatory or assertion or status-related aggression.

Among the 17 aggressive cats, eight were Japanese domestic cats (47%), whereas nine cats were purebred comprised of five Abyssinians, two Russian Blues, and an American Shorthair and a Ragdoll. No gender difference and correlates of neutering were found. All cats were kept indoors only and 76% (13 cats) were the only cats in the household. Nine cats were obtained before two months of age and five were obtained around one month of age. Except for two cases, a single or a few events were identified to trigger the each attack. Eight cats had moved to new houses, four had new members in the family, and ten had fearful experiences including being scolded by the owner, big noises of vacuum cleaner, and that of falling child or object.

Because the attacks by cats were too violent for owners to live with, initial interventions in most cases were either isolation of the cat in a cage at home or hospitalization together with environmental modifications. These procedures usually took at least a month. Twelve cats showing fearful behaviours were concurrently medicated either with clomipramine (Clomicalm®, Novartis) or alprazolam (Solanax®, Pfizer), and three received surgery of declawing and dental disarming for the safety of owners. As for the behavioural modification, systematic desensitization towards

the targets was introduced after the isolation; however, recurrences of severe attacks were reported in ten cats after three to six months.

## **Discussion**

Surprisingly, a high prevalence of feline aggression cases in Japan was found in this study. Beaver (1989) in the United States found 13 percent of 179 feline behaviour cases involved aggression. Hoole (2003) reported that 23 percent of referred cases mainly in the UK consisted of aggression towards people. Although the number of cases in present study is rather small, several reasons may be suggested to explain the difference among countries. One major point may be related to the popularity of behavioural counseling for cats. Because behavioural counseling is a relatively new service in Japan, owners may not know the availability, or it is still regarded as the last resort for a serious situation. Another possibility is that cats in Japan are more aggressive for some reason. This may be affected either by oriental roots of Japanese domestic cats, or specific popular breeds such as Abyssinians may tend to be more aggressive. Abyssinian dominated 29 percent of aggressive cats although they made up only two percent of the cats seen at this clinic during the same time period.

It was also strongly suggested that cats which were brought up singly indoors from an early age may have developed severe aggression when confronted with a novel and fearful stimuli. Although the socialization period for kittens is considered to be between around two and nine weeks of age (Turner 2000), many owners in this current study obtained the kittens earlier in this period. Since more cats are now kept indoors only, this may diminish chances of socializing cats to multiple stimuli. Lack of exercise and stimulation may accumulate excess energy inside animals, which may lead to redirected aggression or misdirected predatory behaviour (Heath 2002).

Several authors have proposed different classifications of aggression in cats that are kept as pets (e.g., Overall 1997; Heath 2002; Schroll and Dehasse 2003; Frank and Dehasse 2003). However, categories in most classifications failed to be exclusive of each other, as some have already pointed out (e.g.; Beaver 2004). In order to develop treatment programs, it seems more practical to classify aggression according to the context rather than its function, that is, aggression towards people and towards cats. In the cases of aggression towards people, safety and reducing anxiety of owners were mainly focused in our treatment programs. We have done as many interventions as possible simultaneously at the early stage, including use of psychotropic drugs in most cases, when the cats seemed to be frightened. Although reduced aggression was found in most cases, severe attacks seemed to recur when owners became less careful about the cats' environment after several months.

## **Conclusion**

In Japan, we definitely have a higher proportion of feline aggression cases especially towards people than in any other statistics published so far in Europe and the

United States. Examining more cases would be necessary to determine if and why aggression towards people is the dominant feline behavioural problem reported in Japan. It was suggested that cats which were brought up singly indoors from an early age may develop severe aggression towards people when confronted with a novel and fearful situation, because of lack of socialization. It was also suggested that some breeds of cats may be more prone to show aggression towards people. We should recognise the significant risks of feline aggression on the lives of owners, and further research is needed to clarify the factors associated with aggression in cats and to establish the efficient preventive and therapeutic interventions.

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## **Keywords**

*aggression, cat, owner, socialization*

# **Evaluation of Immunological, Stress and Behavioural Parameters in Dogs (*Canis familiaris*) with Anxiety-Related Disorders**

**G. V. Berteselli\*, F. Servida, P. Dall'Ara, M. Verga,  
E. Piola, M. Puricelli, C. Palestini**

## ***Introduction***

Stress is a state of altered homeostasis which can be caused by physical or mental factors called stressors. Under this condition the organism reacts with mechanisms that trigger off physiological, immune and behavioural functions to adapt the organism to new situation. These mechanisms belong to “stress system” (SS) (Brazile 1987; Calogero and Serra 1999). The central component of this system is the hypothalamus that releases corticotrophin-releasing hormone (CRH). The first peripheral component is Hypothalamic-Pituitary-Adrenal Axis (HPAA) that is the maximum expression of morpho-functional integration between nervous and endocrine systems, especially by the release of adrenocorticotrophic hormone (ACTH), which stimulates the adrenal glands to produce cortisol that acts on immune system (IS) (Stephens 1981; Milton 1994). The cortisol release depends on circadian rhythms and in dog the cortisol blood level is maximum in the first morning hours, basal during the day and minimum in the night (Hucklebridge et al. 1997; Debenedetti 1998; Cavallone et al. 2001). The second peripheral component is the sympathetic-adrenal-medullary system, which gives a rapid reaction releasing adrenaline and noradrenaline. There is a deep relationship between SS and IS (Wiepekema and Koolhaas 1993). In fact a real “psycho-neural-endocrine-immune circuit” exists where the central nervous and immune systems exchange information directly or

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*Istituto di Zootecnica e Dipartimento di Patologia Animale, Igiene e Sanità Pubblica Veterinaria Sez. di Microbiologia e Immunologia Veterinaria, Faculty of Veterinary Medicine, University of Milan, Italy*  
\*Corresponding author: greta76@libero.it

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through neuroendocrine system (Le Roith et al. 1982; Dantzer and Kelley 1989; Dantzer 1997). The processing of this information produces behavioural, physiological and immune reactions that are normal and adaptive mechanisms for facing stress situations. When the animal's stress situation continues and the animal is unable to cope there is a strengthening of HPA activity with an increase of cortisol secretion and with depression of the catecholaminergic system (Beerda et al. 1996, 1997, 1999a, b). Therefore a bad condition follows and it could cause a highest sensitivity to pathogens and the anomalous behaviours' manifestation which Selye called "adaptation' diseases" (Selye 1936; Rosch 1999). In fact, stress can cause an alteration of immune and inflammatory activity by its chemical mediators cortisol and catecholamines (Stausbaugh and Irwin 1992; Skandakumar et al. 1995, Dall'Ara 1996). The stress reaction becomes a problem when the behaviour is ill-suited in the human environment and when the animal is unable to show a correct behaviour to solve the stress situation. Furthermore when the stress is chronic or unpredictable, the animal shows anomalous and extreme behavioural reactions to decrease the noxious effect of the protracted stress reaction. These behaviours can become a learned reaction and they can be repeated in stressor' presence or in presence of stimulus which predicts the stressor, because they reduce temporally the negative and stress condition. Furthermore uncontrolled stress can cause many consequences in the animal: it can develop alternative behaviours, which turn the animal energy to substitution activity, stereotypies or compulsive behaviours and stress associated diseases. (Overall 1997 Ch 10; Casey 2004 Ch 15). These kind of problems can appear in pets, even if they live in family environment and they are attended carefully. Anyway a stress condition can develop because there isn't a clear and correct communication between human being and dog. This makes an unpredictable social and physical environment for the dog, which is unable to take right information to show correct behaviours. The individual stress reaction depends on genetic factors, experience and on the success of previous mechanisms to face stress (Casey 2004 Ch 15). The aim of this study has been to evaluate and to screen stress and immunological parameters, like cortisol, lysozyme, total IgA and neutrophils' phagocytary capacity, and behavioural parameters in dogs with anxiety-related disorders submitted for behavioural and pharmacological therapy. Another aim has been to study if such therapies have been able to determine any changes of those parameters, if the behavioural improvement was parallel to an improvement of dog immune state and welfare, and if anxious behaviours could be a consequence of stress and become, at the same time, a cause of stress condition of dogs.

### ***Materials and Methods***

Fifteen dogs have been divided in two groups: anxiety group: six dogs with anxiety behavioural disorders examined at Behavioural Clinic in the University of Milan; control group: eight dogs with no behavioural problems. (One dog has been ex-

cluded because his data were insufficient for the statistical analysis). The dogs have been included in the two groups according to the data of their behavioural repertoire collected to a questionnaire. Moreover three anxiety-questionnaires, to be filled out in fixed-terms, (one at the same day of first examination, the second after 2 weeks and the third after one month from the second) have been delivered to dogs' owners. Blood and saliva samples have been taken from each dog. Before eating, the dogs have been submitted to a blood sample by cephalic vein (6–10 ml) and then, the blood has been centrifuged to be analysed. The saliva sampling has been done by wads of cotton-wool, rolled inside of cheeks (0.5 ml), then recovering the saliva by a syringe. This procedure has been repeated three times, after about four and seven weeks during the subsequent behavioural examinations to evaluate the results of the behavioural and pharmacological therapy. Both on blood and on saliva, the titration was executed by RIA method for cortisol (Vincent and Michell 1992; Cavallone et al. 2001), by diffusion in modified Osserman Agar gel for lysozyme (Osserman and Lawlor 1966) and by ELISA sandwich for total IgA. Furthermore, the neutrophils phagocytary capacity has been evaluated on blood samples by an indirect method: Nitroblue Tetrazolium Reduction (Guelfi and Vilcot 1993). The results of titrations have been statistically analysed using Friedman test for the cortisol, IgA and lysozyme variables and Mann-Whitney U test to find out the differences between the anxious group and the control group. The owners' answers to the questionnaire have been scored and analyzed using multivariate statistical analysis by Principal Component Analysis (PCA) and Discriminant Analysis to find out the relation among all variables together and the distribution of the subjects according to them. Furthermore, CHI-SQ test has been used, on the data of first and third questionnaire, to evaluate the behavioural differences between anxious and control dogs.

## **Results**

The PCA analysis has identified the anxious and control dogs. Differences have been found both on behaviour and physiological between the two groups of dogs. On the first component we found a separation between control and anxious dogs. Anxious dogs are identified by behaviours correlated with generalized anxiety. On the second component we found behaviours correlated with separation anxiety. In the first blood sample the cortisol levels were significantly higher in anxious dogs than in the control ones. Furthermore in anxious dogs, cortisol blood levels significantly decreased from the first to the third sample ( $P = 0.001$ ). On the contrary, in the control dogs no significant difference in cortisol level has been found between the two samples. These dogs show lower cortisol levels than the anxious dogs in a first sample and these values remained near the same ( $P = 0.96$ ). The saliva concentration of lysozyme between first and last sample tends to increase in anxious dogs ( $P = 0.18$ ). There is an interesting but not statistical significant difference of blood and saliva IgA average concentration between anxious and control dogs. The anx-

ious dogs have lower blood and saliva IgA concentration than control dogs and, during the time, the IgA values of anxious dogs tend to increase but not significantly. In the control group there isn't such increment. The analysis of neutrophils phagocytary capacity hasn't given appreciable results.

## **Conclusion**

Our questionnaire allowed us to discriminate between anxious and control dogs. Moreover both cortisol and immune parameters changed between the first and the third blood sample. Thus showing decreased chronic stress reactions in anxious dogs and consequently a better immune system activity of these subjects.

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### **Keywords**

*anxiety, behaviour, cortisol, dog, immunity, stress*

# **The Influence of the Experimenter's Expectancy in the Results of the Assessment of Appeasing Pheromones in Stress of Police Dogs (*Canis familiaris*) during Training**

***J. Dehasse\**, *S. Schroll*<sup>1</sup>**

## ***Introduction***

The purpose of this preliminary study was determine whether the use of use of dog appeasing pheromones (DAP), from a continuous release collar, would reduce the stress of police dogs during a training course.

After a family life with their owner (a member of the police force) and basic education for one and a half years, police dogs are separated from their families and brought, with their owners, to a dog training center to undergo two intensive training courses of 7 and 8 weeks' duration, with a 3 to 6 week break between training courses. At the end of these training courses, they are tested to determine their future career. Several dogs may come back for more specialized training sessions. The dogs stay in kennels at the training center during the week and go back to their families during the weekends.

Observations of dozens of previous training courses have indicated that this is stressful for the dogs, as witnessed by symptoms such as barking at night, insomnia, weight loss, diarrhea, salivation, loss of concentration, exhaustion and poor performance. The experience is also very stressful for the police staff owners who are trained with their dog and whose dog will be judged for their suitability to continue as police dogs. The experience was stressful enough to trigger the Ministry of Interior Affairs and the Police Corp to request this preliminary experiment.

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*\*3 avenue du Cosmonaute, B-1150 Brussels, Belgium*

*<sup>1</sup>Hohensteinstr. 22, A-3500 Krems, Austria*

\* Corresponding author: joel.dehasse@skynet.be

## **Materials and Methods**

The experiment was devised as a double blind placebo-controlled 4 week study of nine police dogs undertaking the training course. Five dogs wore DAP collars and 4 dogs wore placebo collars (Schroll and Dehasse, 2005). As indicators of stress levels, weight, (salivary) cortisol and different physiological and psychological parameters were evaluated at the beginning, during and at the end of the trial.

The Ministry, Police officials and dog owners were informed of the experimenters' expectations of reducing stress, and were educated on stress indicators.

## **Results**

Data were analyzed with the Mann-Whitney, the Wilcoxon and the Fisher-Yates tests, using the SPSS program. Nearly significant results were found for the weight loss in the placebo group ( $p = 0,069$   $n = 4$ ) and significant results for the difference of saliva cortisol level between placebo and DAP groups in the second week ( $p = 0,016$ ), the placebo dogs showing an elevation in cortisol but not the DAP dogs. Several nights, one dog in each group barked 10 minutes, and one placebo dog was found panting several mornings, but overall the dogs slept amazingly peacefully, contrary to expectations. There was no significant difference in sleep quality and (lack of) vocalization between placebo and DAP dogs.

## **Discussion**

The sleep quality and lack of nocturnal vocalizing caught our attention. A reduction of barking and insomnia at night was somewhat expected in DAP dogs, but not at all in the placebo dogs. And a high quality of sleep was not expected at all and never documented in the 15 years this facility has been run, with two to three training sessions a year. They report there has always been always sleep problems linked to barking at night and the trainers have even had to use anti-barking collars to reduce the problem. One dog was at the facility for the third time and was well known as a relentless barker.

The tranquility of (placebo and DAP) dogs at night is not easily explained. It made us think of the Hawthorne, Pygmalion and Experimenter effects. These effects can be measured in experimental designs but the rationale behind them is still speculative.

The Hawthorne effect is defined by Draper as "an experimental effect in the direction expected but not for the reason expected; i.e. a significant positive effect that turns out to have no causal basis in the theoretical motivation for the intervention, but is apparently due to the effect on the participants of knowing themselves to be studied in connection with the outcomes measured". Owners and trainers were under observation and may have been subjected to the Hawthorne effect. The problem with the Hawthorne effect is that it is unpredictable and only observed a poste-

riori. "So as a methodological heuristic, it is useful, but as an exact predictor of effects, it is not: often there is no Hawthorne effect of any kind." (Draper, 2005).

The Pygmalion (or Teacher) effect is a change in the performance of subjects in experimentation in the direction expected by the experimenter. Typically, said Draper (2005), "if teachers were led to expect enhanced performance from some children, then they did indeed show that enhancement". While not scientifically documented in animals, dogs might be influenced by the Pygmalion effect by their owners and trainers.

The experimenter's effects are positive or negative effects linked to expectations acquired consciously or unconsciously from the researcher and is particularly seen in behavioural research. Prophesying an effect might create this effect or its opposite. Talking about the experimenters' expectations to the police officials, dog owners and trainers may have influenced the outcome of the training results and the well being of the dogs. But nobody ever expected the effects to be better than the prophecy, as in this case.

Another possible effect could be related to a distant healing effect researched by Sicher and Targ (1998) in a triple-blind 6 month trial on human patients with end-stage AIDS that showed that having a focused intention for a patient to heal and be well had significant effects on the patient's well-being. In this study, healers from different philosophies and religions such as Christian, Lakota Sioux shaman, Qi Gong Master, Jewish Cabbalist, Buddhist, were asked to hold an intention for the health and well-being of the patient for an hour a day, six days a week, for ten weeks (with alternate weeks off for rest), without the patient being aware he was submitted to this intention. Significant differences were found in favour of the treated group. They were healthier in every parameter, such as days of hospitalization, development of new AIDS-defining illnesses and improved mood.

We are not trying to explain how focused intentions might work, just that they might have an effect on the health of a patient and that we should take this effect into consideration in experimental trials and, also, in therapy. This "Intention effect" may be part of the placebo effect. In scientific research, we might not be interested in analysing the different components of the placebo effect and we may be just satisfied with the difference between the treatment group and the placebo group. But in clinical practice, if the placebo effect is part of the benefits the patient gets from the treatment we may therefore have better results when we intend a patient to heal than when we do not believe in its healing. We still do not know how much of the therapeutic effect is due to the counsellor or to the conviction of the owner that the animal will improve, but we are now conscious it has an effect.

## **Conclusions**

In conclusion, we cannot exclude the hypothesis that the beliefs of the experimenter may affect the results of experimentation and, by extrapolation, that in a clinical

therapeutic setting, we hypothesize that the beliefs of the counsellor and of the owner might affect the results of the treatments.

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### **Keywords**

*DAP, healing, intention, pheromone, stress*

# **The Control of Puppy (*Canis familiaris*) Disturbance of Owners at Night**

***K. Taylor\*, D. S. Mills***

## ***Introduction***

It is widely recognised that entry into a new home is a stressful time for the dog. For youngsters it may coincide with the ending of the mother-puppy bond as well as transferral from a familiar location to a completely novel one, both of which can be traumatic for the puppy (Elliot and Scott 1961, Pettijohn et al. 1977, Slabbert and Rasa, 1993, Serpell and Jagoe, 1995). One common problem reported by the owner of a new puppy is vocalisation when separated from the owner (especially at night) and the resulting disturbance of sleep patterns for both puppy and owner. This can not only be upsetting to the new owner but might suggest that the puppy is showing signs of separation distress (Elliot and Scott 1961, Pettijohn et al. 1977). Indeed, the tendency to protest vocally when subjected to social isolation may be at its strongest at just the age when puppies are typically homed (6–10 weeks, Elliot and Scott 1961). Owners may be tempted to comfort their pet when it vocalises which may encourage the problem further (Askew 1996).

Dog Appeasing Pheromone (DAP, Ceva Santé Animale) has been reported to be useful in relieving anxiety associated with firework noises (Sheppard and Mills, 2003), travelling (Gandia Estelles and Mills, 2005), being left alone (Gaultier and Pageat, 2002) and within the rescue shelter environment (Tod et al. 2005). Since this mixture is produced when the bitch is suckling her puppies, it is hypothesised that continued provision in the new home may help familiarise the environment to the puppy and thus comfort them particularly when they are left alone. Case reports have suggested that DAP is useful in helping puppies settle into their new home by

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*Animal Behaviour, Cognition and Welfare Group, University of Lincoln,  
Dept of Biological Sciences, Riseholme Park, Lincoln, LN2 2LG U.K.*

*\*Corresponding author: dmills@lincoln.ac.uk*

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reducing the frequency of disturbed nights and maintaining the puppy's emotional stability (Mills, pers obs.). However, there have been no controlled studies of the effect of DAP on vocalisation at night by puppies. Comparison of efficacy against placebo is important if one is to have confidence that improvement is due to the specific effects of the product and nothing else.

## **Materials and Methods**

Pedigree puppies and their new owners were recruited from contacts with a range of private dog breeders in the local area. Recruitment ceased when 60 puppies had been recruited. Upon entry onto the trial, puppies were allocated to receive either A or B diffuser. The study was conducted as a double blind, placebo-controlled, longitudinal study. Sixty new puppy dog owners received one plug-in diffuser designed for the slow release of DAP into a room over four weeks. Thirty of these contained DAP (verum) and 30 contained the carrier fluid only (placebo). In all cases diffusers were installed in the new home a few days prior to the puppy's arrival. The diffusers were labelled as A or B and their true identities were not released to the researcher, trial supervisor or recruits until all the statistical analyses had been completed. The effect of the diffuser on the puppy's disturbance at night was recorded by the owner for eight weeks in the form of a personalised calendar.

A general linear model (GLM, Minitab v13.3, Minitab, Inc., USA 2000) was fitted to the total number of nights the puppy was reported to disturb the owner. The fixed effect of treatment (A or B) and the random effects of sex (male or female), breed category (gundogs or other) and age category (less than eight weeks old at purchase or older) were included as explanatory factors. The interaction between treatment and each random factor was also included. Post-hoc analysis was carried out using Mann-Whitney tests.

## **Results**

There was wide variation in the total number of nights that the puppies were reported to have disturbed their owner over the first two months in the new home.

Initial exploration of the data found that whether the puppy was sleeping with another dog (i.e. in the same bed) had a dramatic effect on whether they were reported to disturb the owner at night. Over 60 percent of those not sleeping with another dog disturbed their owner on at least two of the first three nights in the new home. The final GLM was fitted to the results from puppies that slept on their own with two outliers removed ( $N = 47$ ).

There was no evidence for the effect of treatment, breed, age or sex alone on the total number of nights crying ( $p > 0.05$ ). However there was a significant treatment/breed interaction ( $F = 7.99$ ,  $p = 0.007$ ). Gundogs in the placebo group cried for a median of nine nights compared to three nights in the verum group (Mann-

Whitney test;  $W = 117.5$ ,  $N = 7$  (placebo), 14 (verum),  $p = 0.003$ ). Irrespective of breed, puppies with a tendency to cry disturbed their owner for a median of 3 nights if they were in receipt of DAP. Those with a tendency to cry that were in receipt of placebo cried for a median of 7 nights.

## **Discussion**

This study suggests that DAP appears to reduce the tendency for prolonged crying at night. DAP does not appear to prevent vocalisation at night *per se*, but does appear to help reduce the persistent problem in at-risk individuals. The breed effect recorded appears to have arisen because gundogs were more likely than other breeds to disturb at night for a prolonged period in the absence of DAP. We hypothesise that the initial introduction into the new home and subsequent isolation at night may be so stressful that any effect of DAP at this time is masked. Since those puppies in the study that had another dog to sleep with rarely disturbed their owner, it would seem that the presence of a conspecific at this time may be the most effective buffer of the problem. Puppies that showed a tendency to disturb at night during the first three days in the new home failed to continue to disturb when DAP was used. Those that remained unsettled after three days that were not in presence of DAP tended to continue to disturb for more nights. The fact that many of these puppies were gundog breeds is interesting. This might be an artefact of the study or it may reflect a genuine tendency for this breed to be more affected by separation (which included Labradors, Weimaraners and Spaniels). This would make sense since these breeds are particularly popular as family pets and selection for increased sociability may have resulted in animals that cope less well to separation, particularly from humans. Indeed, it has been shown in another study that Labradors are more likely than Border Collies to show signs of separation-related problems (Bradshaw et al. 2002).

## **Conclusions**

The results suggest that, where puppies are going to homes with no other dogs, DAP might help to reduce the likelihood of prolonged disturbance at night. Where other dogs are present, the puppy should be allowed to sleep with it, if it is safe to do so.

## **Acknowledgements**

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## Keywords

*dog, pheromone, puppy, separation, stress, vocalisation*

# The Use of the DAP® Collar to Reduce Stress during Training of Police Dogs (*Canis familiaris*): A Preliminary Study

**S. Schroll\***, **J. Dehasse<sup>1</sup>**, **R. Palme<sup>2</sup>**,  
**I. Sommerfeld-Stur<sup>3</sup>**, **G. Löwenstein<sup>4</sup>**

## **Introduction**

In Austria, police dogs are given to their owners as puppies at 8 weeks of age. For the first one and a half years, the dog lives with the family and receives a basic education.

After this basic education, when they are 16 to 22 months of age, police dogs start an intensive training course for 15 weeks (7 and 8 weeks respectively, with a 3 to 6 week pause in between). During this training course, which is held at a special training center, the dogs stay in kennels, separated from their owners at night. During the working days, the dogs are trained extensively in various environments.

After the training course, the dog and its owner have to pass an examination before it is accepted as a professional police dog. This training course is therefore very stressful for both owners and dogs.

According to trainers and owners during previous courses in past years, the most prevalent signs of stress were: excessive barking and howling at night (in some cases, the whole night), increasing excitement, fatigue, lack of concentration at work, weight loss, diarrhea, and salivation.

Isolation and social separation from familiar humans in a novel environment is

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\*Hohensteinstr. 22, A-3500 Krems, Austria

<sup>1</sup>3 avenue du Cosmonaute, B-1150 Brussels, Belgium

<sup>2</sup>Department for Natural Sciences/Biochemistry, University of Veterinary Medicine Vienna, Veterinärplatz 1, A-1210 Wien, Austria

<sup>3</sup>Institute of Animal Breeding and Genetics, University of Veterinary Medicine Vienna, Veterinärplatz 1, A-1210 Wien, Austria

<sup>4</sup>Grub 1, A-3351 Weistrach, Austria

\* Corresponding author: sabine.schroll@aon.at

considered a stressful event for a highly social species such as dogs. (Tuber et al. 1996). The absence of the human attachment figure combined with a novel environment causes some adult dogs to exhibit behavioral signs such as vocalization and physiological changes including the activation of the hypothalamic-pituitary-adrenal (HPA) system. There is a statistically significant correlation between cortisol concentrations in saliva and plasma (Vincent and Michell 1992).

The leader of the training center was interested in investigating solutions to reduce the stress on dogs during training with two considerations in mind; the well-being of the dogs and their owners, and the improvement of the performance of these highly valuable dog-human-teams. The Ministry of Internal Affairs approved and financed an experimental study with dog appeasing pheromone. The purpose of this study was to evaluate the effects of the dog appeasing pheromone in a new galenic form—as DAP collar—on stress symptoms during the basic training course.

The hypothesis of the study is that dogs with the DAP collar will show fewer stress symptoms than dogs with the placebo.

## ***Materials and Methods***

This is a double-blind placebo-controlled study which ran over a period of 4 weeks.

Nine male dogs (2 German Shepherds, 4 Malinois, 2 Dutch Herder and 1 Giant Schnauzer) that were between 19 and 22 months (mean value 21 months) in the training course were divided into 2 groups (randomized by age, breed, province). Five dogs received a DAP<sup>®</sup> collar (CEVA France) and 4 dogs received a placebo collar at the beginning of the course. The dogs wore the collars all the time during the test period. To eliminate an influence from dogs with a DAP collar on the placebo dogs during the daily car rides, only dogs from the same group could be together in a car. The dogs were also living in adjacent kennels together with their group, with a free kennel in between the 2 groups.

During the night, the dogs were confined in the closed indoor part of the kennel between 9 p.m. and 5 a.m. The outdoor part of the kennel was opened at 5:00 in the morning by the trainer. The trainers and the owners lived in another part of the house and could hear their dogs when vocalizing at night. The dogs were fed between 6:30 a.m. and 7:30 a.m. At 8 a.m, they were transported by car to the various training environments. The working day ended at 4 p.m. and the owners were free to care for their dog individually—massage, play, relax, walk in the forest, etc. On the week-ends, owners and dogs were at home with their families.

None of the usually used anti-barking collars were allowed.

The placebo collars were regular DAP collars, but with the components of DAP destroyed. The original packages were opened and the collars exposed to warm temperatures (sun and heater) and moved daily for more than 4 weeks (the producer gives up to 4 weeks as the time for effective use on the dog). After this period the collars were laid for 1 hour in hot water (approximately 70–80°C) and for

30 minutes in 70% alcohol to completely remove and destroy the components of the DAP. The DAP collars were opened only the day before the course. After this procedure there was no visible external difference between the placebo and the DAP collars except for a group identification symbol drawn on the clip.

Before the training course, the dog owners were informed about the purpose of the experiment and received handouts with instructions and a short presentation about signs of stress, as well as the basic rules for greeting and leaving the dogs.

Every dog was physically examined and weighed at the beginning and the end of the study.

Saliva samples for cortisol tests were collected by letting the dog chew on cotton balls (Salivette®, Sarstedt). The first samples were taken at home the day before the arrival at the training center. The following saliva samples were collected on the first day of each week in the early morning (evaluation of stress during the first separation/night each week); and, in the afternoon of the same day, immediately after training (evaluation of training stress). The saliva samples were frozen in a household freezer. At the end of the study, the concentrations of saliva cortisol were measured by a radioimmunoassay at the Department for Natural Sciences/Biochemistry, University for Veterinary Medicine in Vienna.

Physical and behavioral signs such as appetite, salivation, diarrhea, panting, destructiveness, vocalization at night and the psychological condition (relaxed, excited, exhausted, concentration at work) were determined on a daily basis by the owner. The learning capacity and performance at work as well as vocalizing at night and the condition after opening the indoor kennel in the morning were determined independently on a daily basis by the trainer.

Data analyses were made with the Mann-Whitney test, the Wilcoxon and the Fisher-Yates test, using a software program (SPSS, version 9.0.1).

## **Results**

From the first training day on, all dogs were quiet during the night. This was interesting and not expected. Only one dog of each group barked during the 4 weeks and this was for a few times and for less than 10 minutes. Usually, when one of these highly reactive dogs starts barking at night, several other dogs will follow and there is increasing excitement and vocalization for a long time. In this training course, surprisingly and for the first time in years, no dog reacted to the vocalization of another dog.

In the morning, the dogs were relaxed and sometimes came out yawning and stretching, obviously aroused directly from sleep, out of the indoor kennel. Only one dog from the placebo group panted excitedly on several mornings and one time another dog from the placebo group destroyed his plastic basket.

There were no dogs with diarrhea, salivation or appetite loss.

The weight of the dogs in the DAP collar group remained stable; the dogs in the placebo group lost weight. Even though  $p = 0.069$  is just slightly above the sig-

nificant value, this result should be considered an important fact and a sign of a possible chronic stress.

The difference in the values in morning saliva cortisol between the DAP and the placebo group was statistically significant in the second week of the training course ( $p = 0.016$ ). The performance and the psychological condition of all dogs were very good according to the owners and the trainer. Every dog was successful in the tests at the end of the training period and was accepted for police service.

## **Discussion**

Results of the present preliminary study suggest that, compared with a placebo collar, DAP collars significantly reduce stress symptoms in dogs that are triggered by social separation and intensive training in a novel environment. The atmosphere during the whole training course was relaxed and respectful. Knowing that the dogs felt better in the kennel and performed well during the working day had obvious effects on the well-being of the humans—owners as well as trainers—too.

Of course, the sample group size of nine dogs is not large enough to establish a continuous level of significance. The behavior of this group of dogs was a bit unusual because little of the stress behavior previously reported in these training conditions was seen here.

## **Conclusion**

We can conclude that the DAP collar, in combination with education of the owners is effective to reduce stress symptoms in young adult police dogs during their crucial training course.

From a systemic and clinical point of view the subjective satisfaction and well-being of the owners and trainers is very important for a sympathetic attitude when teaching their dogs.

These data should be viewed as an adequate basis for further studies.

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## **Keywords**

*DAP, separation, social, stress*

# Rearing Environment and Behavioral Development of Psittacine Birds

**A. U. Luescher\*, K. Sheehan**

## ***Introduction***

The environment is thought to have a strong impact on young animals, and experiences during a relatively short period early in the animal's life may have lasting effects on how the animals will react later in life. This also holds true for parrots (Coulton et al. 1997, Nicol and Pope, 1993). Environmental enrichment early in life will increase the motivation for exploration and reduce neophobia (Nicol and Pope, 1993; Holsen, 1986). Early environmental enrichment also fosters species-typical behavior and reduces abnormal and detrimental behavior (Clayton and Krebs, 1994; van Hoek and King, 1997; Coulton et al. 1997). Enrichment also positively influences brain development (e.g., Turner et al., 2002; Rosenzweig and Bennett, 1996; Rosenzweig, 1984), and learning ability (Winocur and Greenwood, 1999; Cooper and Zubek 1958, Renner and Rosenzweig, 1987). Housing young birds in pairs has been shown to be beneficial compared to single-bird housing. Pair-housed birds were more interactive with the environment, less fearful, and engaged more in adaptive behavior and performed less detrimental or abnormal behavior (Meehan et al., 2003). Gentle early handling imposes a mild stress on the young bird, but is beneficial because it reduces detrimental reactions to non-avoidable chronic stress while intensifying potentially life-saving reactions to acute stress (Levine, 1960). The more early stimulation is provided to the young animal, the greater the decrease in emotional reactivity (Denenberg 1969).

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*Dept. Veterinary Clinical Sciences, Purdue University, VCS LYNN, 625 Harrison Street, West Lafayette, IN 47907-2026, USA*

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

Current Issues and Research in Veterinary Behavioral Medicine

## **Subjects and Methods**

A total of 80 domestically bred Nanday conure (*Nandayus nenday*) chicks were involved in this study, which was conducted at Kaytee Aviaries near Pensacola, Florida. Of these 80 birds, 48 were assigned as test subjects, 27 provided social companionship for enriched subjects, 4 were dropped due to poor health, and 1 chick died due to ingestion of its pine pellet bedding. Individual birds were identifiable by their leg bands. Birds were taken from the nest box at about 2 weeks of age, monitored for a few days in the nursery and then, at approximately 3 weeks of age, were randomly assigned to treatment. Until 9 weeks of age, all chicks were kept in tubs with either pine pellet or pine shaving bedding. After the treatment phase of the study, when the birds were approximately 9 weeks of age, they were re-housed in cages with 4 birds to a cage. Most birds began weaning onto solid food at 9 weeks of age and were fully weaned (eating enough on their own to maintain their body weight) by 12 weeks of age. Birds in cages were given free access to dry food (Kaytee Exact—Rainbow Extruded Diet) and water. While housed in cages, all birds were handled briefly, for approximately 5 minutes, once per week. These “step-up” lessons were designed to keep the birds manageable and to maintain a degree of tameness so they could be sold as pets after the end of the study.

The study consisted of 4 hand-raising treatments, each with 12 subjects assigned to them in a 2 × 2 factorial design. These treatments were:

1. Subjects housed in an Enriched environment and given periods of additional daily Handling beyond routine handling (E/H),
2. Subjects housed in an Enriched environment and Not given extra daily handling (E/N),
3. Subjects housed in a Restricted environment and given periods of additional daily Handling beyond routine handling (R/H), and
4. Subjects housed in a Restricted environment and Not given extra daily handling (R/N). This treatment reflects the method of hand-raising parrot chicks employed in many commercial breeding facilities with the exception that small species of psittacids are sometimes housed in groups.

The handling aspect of treatments 1 and 3 consisted of 15 minutes per day of handling throughout the 6-week treatment period. Enriched chicks were housed with one sibling and the plastic tub they were kept in was wrapped with brightly colored paper on three sides with the open side facing the room. In contrast, restricted subjects were housed alone and had their tubs wrapped in plain brown paper on 3 sides. Physical enrichment consisted of a set of 20 colorful, chewable, bird-safe toys for each enriched subject.

Weights were recorded once per week from 3 to 10 weeks of age, again at 2 weeks post-weaning and once more at 6 weeks post-weaning. Feather length was

measured once per week from 3 to 10 weeks of age, and then again at 2 weeks post-weaning. The feather measured was the 2nd primary feather of the left wing on each bird. The age, in weeks, when the chicks were fully weaned (i.e. when they were eating enough on their own to maintain their body weight) was recorded. They were also photographed once per week throughout the treatment phase of the study and again at 2 weeks post-weaning.

### **Novel object test**

Each chick was presented with a novel object once during the pre-weaning period in a tub similar to the home-tub but containing only bedding and the novel object. There were 6 test ages: 4, 5, 6, 7, 8, and 9 weeks of age. Each chick was only tested once during development so as to avoid any enriching effects of the test procedure. The Novel Object trials were 10 minutes in duration. Chicks were put into the center of the test-tub and, after a 2-minute acclimatization period, a novel object was introduced at the end of tub opposite to the chick's current position. The chicks' initial reactions to the object, latency until they touched the object, and duration of time they spent actively exploring the object were recorded. Initial reactions were then rated on a scale of fearfulness from 1 to 9 with 1 being most curious, 9 being most fearful, and 5 being neutral.

### **Novel conspecific test**

This test consisted of a single 1-minute trial per pair of chicks. It was conducted when the chicks were approximately 9 weeks of age. In a large tub styled similarly to their home tubs, but about twice the size, two closely aged but unrelated and unfamiliar birds were placed one on each side of a partition. This divider was then lifted and the experimenter recorded whether or not the birds approached each other during the 1-minute trial.

### **Open field test**

This test was conducted when the birds were approximately 10 weeks of age. Chicks were placed in the center of the field. The 10 minute trials were recorded using a small camera hanging directly above the field and operated by remote control. The data were later collected from the recordings. The experimenter recorded the number of squares the birds entered during the 10-minute trial and the number of seeds (placed previously in the squares) they ate as well as their latencies to take their first step, to shake out their feathers, and to pick up a seed. The experimenter was not aware of which treatment the chicks were in both during the test or while recording data from the tape.

### **Emergence test**

At approximately 11 weeks of age, each subject underwent an Emergence test of timidity. The apparatus used consisted of a rectangular box that was divided into



two equally sized compartments by a partition fitted with a small 100mm square guillotine-style door. One half, the dark side, was covered by a solid lid and painted black inside. The other half, the bright side, was covered by a wire mesh lid and painted white inside. High-gloss paint was used for easy disinfection of the apparatus between subjects. Chicks were placed into the dark half (the start box) and allowed a 2-minute acclimatization period after which the door was raised providing access to the bright half of the box (the goal box) which contained 5 shelled sunflower seeds. The trial continued until the bird fully emerged into the bright half, or until 10 minutes had elapsed from the time the door was opened. The latency for the chicks to poke their heads out of the hole (head emergence), and the latency for them to pass completely through the hole (body emergence) were recorded. At the time of testing, the experimenter was not aware of the treatments the birds had been in.

### **Latency to take a hand-held treat test**

This test was performed 4 weeks post-weaning (around 16 weeks of age) and consisted of a single 10-minute trial. Each bird was gently held at a position on a counter approximately 510mm away from a hand-held treat. Then it was released and the experimenter recorded the time it took for the bird to approach and take the offered treat. Birds that did not take the treat within 10 minutes were assigned a score of 600 seconds.

### **Behavioral assessment**

At 6 weeks post-weaning all of the birds were subjectively evaluated using a series of dichotomous variables regarding how they responded in various situations. First, the birds' cage door was opened and the experimenter recorded whether they approached the open door and/or came out of the cage or stayed back. Next, the experimenter moved her hand slowly into the cage and recorded whether or not the birds moved away from the hand, then the experimenter offered the birds a hand-held treat and recorded whether they took it or not.

The next phase of the assessment involved getting the birds out of their cage and onto the experimenter's hand. It was recorded if they stepped up, and how they reacted to restraint and to petting.

### **Learning test**

The conures were tested in a Color Discrimination task at 6 weeks post-weaning (approximately 18 weeks of age). This consisted of learning which of 3 differently colored plastic bottle caps contained a food reward underneath it. The apparatus used was a wedge-shaped wooden box painted white and containing 2 compartments: a start-box at the narrow end with a sliding guillotine-style door that provided access to the testing compartment. The entire apparatus was covered by a hardware-cloth lid to prevent the birds from flying out. The test chamber contained a sliding tray (also white), with 3 food wells in the bottom that could be covered

over by plastic bottle-caps of varying colors. At 6 weeks post-weaning, the 37 birds that had completed a training phase were tested. For the test phase, the start box door was affixed to the apparatus, and 3 differently colored plastic bottle caps (red, green, and yellow) were used. The test subjects were food deprived overnight, then, after randomly determining the bottle cap color associated with the reward and its location sequence, each bird was placed in the start box with the sliding door in the closed position. The tray of food wells was then set up with the 3 caps covering the 3 food wells in the prearranged order and the start box door was raised. When a bird displaced a cap, the tray was withdrawn before the subjects could choose another cap. The color and position of the displaced cap were recorded. If the bird chose correctly, it was allowed to eat the treat, and then it was put back into the start box and remained there for a 20 second inter-trial interval as the tray was set up for the next trial. Many birds quickly learned this routine and would go back into the start box on their own after the tray was withdrawn.

On any given day, this procedure was repeated until the bird either chose correctly 9 out of 10 times in a row or it completed 20 trials—in which case, it was given another set of trials the next day. Testing was performed in this way for 3 to 5 consecutive days depending on a subject's rate of acquisition of the response.

Additional notes on various behaviors of the chicks were made during the course of the study when the researcher noticed any potentially differing behaviors between chicks.

## ***Results and Discussion***

Regarding the chicks' physical development, Enriched chicks weighed slightly more than Restricted chicks at 6 weeks of age. There was no evidence that rearing condition affected their final weight, feather growth, or age at weaning. This is possibly because the birds were not subjected to treatment conditions at an early enough age.

Behaviorally, this study found that both enrichment and handling resulted in a significant decrease in the chicks' fear levels in a variety of situations. When presented with a novel object, Handled chicks touched it sooner, and both handling and enrichment had a significant effect prolonging the duration of exploration. The age at which the test was performed did not influence treatment effect. However, older birds (except the Enriched, Non Handled group) showed increased initial fear of the object with increased age.

Additionally, Restricted Non-Handled chicks were less likely to approach a novel conspecific than any of the other birds. Handled chicks entered more squares in an Open Field, although the measurements of latency and the numbers of seeds eaten did not differ. There was no difference in the latency to emerge from a dark box.

Fully grown (4 weeks after weaning, about 16 weeks of age) Handled birds, following infrequent handling for the previous nine weeks, took a hand-held treat sooner, and were more likely to allow the experimenter to restrain them, suggesting long-lasting consequences of early experience. Handling appeared to have differential effects on Enriched versus Restricted birds concerning the likelihood that they started biting after weaning. Handled Restricted birds were less likely to bite while Handled Enriched birds were more likely. This might be because Restricted birds were housed alone and so bonded more strongly to the handler than Enriched birds, who were housed with a conspecific.

This study found no evidence that enrichment or handling affected the cures' learning ability in a Color Discrimination test at 6 weeks post weaning. It is probable that the test (a simple discrimination test without reversal) was not difficult enough to detect any differences so a more challenging test at a later age when birds are keener to get solid food should be devised for future studies. At least a reversal trial, and concept formation (e.g., sameness, matching to sample) should be included.

## **Conclusions**

It is concluded that enhancing the rearing environment of psittacine chicks through enrichment and handling will improve their psychological and physical well-being and should be incorporated into the rearing practices of facilities breeding for the pet trade. It is predicted that such rearing methods will improve the ability of a parrot to adjust to captive life, and that the incidence of stress-related problems might be reduced. These results support criticism of factory-like mass-production of birds with minimal handling, no social contact, using opaque tubs without enrichment.

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**Keywords**

*behavior, development, environment, learning, psittacid, rearing*

# **Comparison of 24 Cases of Canine Fear-Related Aggression with Structured, Clinician-Initiated Follow-Up and 42 Cases with Unstructured Client-Initiated Follow-Up**

***L. A. Radosta-Huntley\*, I. R. Reisner, F. S. Shofer***

## ***Introduction***

Canine aggression is the most common presenting complaint in cases referred to behavioral specialists in the United States (Reisner 2003a) and fear-related aggression is the most common behavioral diagnosis for dogs (*Canis familiaris*) referred to a university-based behavior referral service (Reisner 2003b). Management of fear-related aggression in dogs involves behavior modification through training and behavioral medication, environmental modification and safety recommendations (Landsberg et al. 2003). Client communication is particularly important in the management of behavior problems because of the need for continuing care and the many behavioral and environmental changes involved. In addition, aggression is a frequent cause of relinquishment to humane shelters and veterinarians, in many cases resulting in euthanasia of the dog (Overall and Love 2001). It is recognized in human medicine that patient satisfaction is positively correlated with time spent with the patient and the quality of the doctor-patient interaction (Teutsch 2003). We are aware of no such studies of the relationship of client communication to satisfaction or outcome in veterinary behavioral medicine. Our objective in this study was to compare two methods of post-consultation follow-up communication for cases of canine fear-related aggression, in order to determine whether there is a difference in perception of satisfaction or in outcome.

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*Matthew J. Ryan Veterinary Hospital at the University of Pennsylvania,  
3900 Delancey Street, Philadelphia, Pennsylvania, 19104 USA*

*\*Corresponding Author: lradosta@vet.upenn.edu*

## ***Materials and Methods***

### **Study design**

A telephone survey was conducted of 80 cases of canine fear-related aggression referred to the Behavior Clinic of the Matthew J. Ryan Veterinary Hospital of the University of Pennsylvania from September 3, 2003 to September 21, 2004. Treatment of fear-related aggression followed a standard treatment program (Seibert 2004) which included safety recommendations, environmental and behavior modification and potentially the use of medication. All clients were given the office telephone numbers and email addresses of clinicians and support staff. Cases were retrospectively divided into two groups based on the type of follow-up they had received.

Owners of Group A dogs were told verbally and in writing at the time of the appointment to contact the clinician or a member of the support staff for help as needed, but did not receive a specific follow up schedule. Contact was not initiated by the Behavior Clinic more than twice over the six month period. Owners of Group B dogs were instructed verbally and in writing at the time of the initial appointment to contact the clinician at 10, 30 and 60 days by e-mail or telephone depending upon the client's preference. This group was also informed that they would be contacted for follow up if they did not contact the Behavior Clinic at the scheduled times. If a client had been given a follow-up schedule and did not contact the clinician at the scheduled time, contact was initiated by the clinician or a member of the support staff by the client's preferred method of contact (either telephone or e-mail). If the client did not respond within 5 days, a telephone contact was attempted. If, at that time, the client again failed to respond, that contact period was terminated. However, the client was contacted in the same manner after the next scheduled interval. If the client contacted the clinician or a member of the support staff for any purpose within 3 days of the scheduled contact date, a behavioral update was requested at that time and contact was not initiated at the next scheduled time.

### **Recruitment of participants**

All clients were contacted for a brief interview by telephone by an interviewer who was blind to the criteria for group assignment and the purpose of the study. Clients had not had prior contact with the interviewer. If clients could not be reached by phone, they were then contacted by e-mail by a member of the support staff and invited to participate. If they responded affirmatively to the invitation, they were then contacted by the interviewer from a separate e-mail address unassociated with the veterinary hospital. All participants were offered an incentive of a ten dollar gift certificate to a local pet supply store for their participation in the survey. This study protocol was reviewed by a university institutional review board for human subjects research.

## Survey

The interview consisted of questions regarding the dog's aggressive behavior subsequent to the initial appointment, the client's perception of outcome and of the accessibility of the Behavior Clinic, whether the perceived accessibility affected the outcome of their dog's treatment, and overall satisfaction with the service they had obtained.

## Statistical analysis

To determine differences between the two groups, the chi-square or Fisher's exact test (for  $2 \times 2$  tables) was used for categorical variables and Student's t-test was used for continuous variables such as number of contacts or number of bites. Where applicable, data are presented as frequencies and percentages or means with ranges. All analyses were performed using SAS statistical software (Version 9.1, SAS Institute, Cary NC). A p-value  $< 0.05$  was considered statistically significant.

## Results

Eighty clients (33 in Group A, 47 in Group B) met the criteria for inclusion into the study. For Group A, 24 (72%) clients agreed to participate by either telephone ( $N = 23$ ) or by e-mail ( $N = 1$ ). For Group B, 42 (89%) clients agreed to participate by telephone. Of the 10 non-responders, seven were in Group A and three were from Group B. Additionally, five clients (3 in Group A and 2 in Group B) declined to participate in the study. Of these, one of the pets had been euthanized for an unknown reason, one pet was still in the home, and the disposition of the 3 remaining pets was unknown.

## Outcome

Group B clients were more likely to perceive their dog's aggressive behavior as *resolved*, *much better*, or *somewhat better* compared to Group A clients (86% vs. 58%, respectively,  $p = 0.02$ ). Similarly, Group B compared to Group A clients were more likely to perceive their dog's level of anxiety as *resolved*, *much better*, or *somewhat better* (88% vs. 54%,  $p = 0.04$ ). There was no significant difference between the groups regarding the mean number of bites that occurred in the first six months following the initial consultation (2.6 bites vs. 3.1 bites respectively for Groups A and B,  $p = 0.1$ ).

## Preference of communication and adequacy of contacts

There was no significant difference in client preference regarding mode of communication (e.g., email, phone, fax, mail) or follow-up schedule (e.g., client initiated, clinician initiated). However, there was a difference between the two groups regarding with whom the client preferred to speak. The majority of clients did not have a preference when asked if they preferred to speak to a clinician or support staff

member. Among clients who had a preference, Group A clients were more likely to prefer to speak with a member of the support staff as opposed to Group B clients who preferred to speak to the clinician ( $p = 0.002$ ). Client opinion regarding the adequacy of the number of contacts differed significantly between the two groups ( $p = 0.003$ ). Group B participants were more likely to say that the number of contacts was *just right* (B: 81%,  $N = 34$ ; A: 46%,  $N = 11$ ). Alternatively, Group A clients were more likely to characterize their follow up contacts as *not enough* (A: 46%,  $N = 11$ ; B: 10%,  $N = 4$ ).

### **Outside advice**

When clients were asked whether they had sought other sources of behavioral advice, 88% ( $N = 37$ ) of Group B clients did not contact an outside party for help with their dog's behavior, in contrast to 65% ( $N = 15$ ) in Group A clients who did ( $p = 0.05$ ).

### **Accessibility and satisfaction**

Group B clients were more likely to perceive accessibility as very accessible or accessible compared to Group A clients (93% vs. 57%, respectively,  $p = 0.003$ ). Similarly, Group B compared to Group A clients perceived the treatment to have a positive effect (76% vs. 43%,  $p = 0.02$ ), were more likely to be satisfied with the behavior service (98% vs. 65%,  $p = 0.002$ ) and were more willing to return to the service with their dog (95% vs. 68%,  $p = 0.006$ ).

### **Discussion**

The findings of this study suggest that when structured and planned contact is initiated with owners of dogs with fear related aggression, the cases have a more positive outcome, clients are more likely to be satisfied with their dog's care and are more likely to return to the behavior specialist if the need arises. The importance of doctor-patient communication and its link to client satisfaction and a willingness to return to the medical care facility has been documented in the human literature (Teutsch 2003). Previous to this study, veterinary client satisfaction and willingness to bring their pet back to the veterinary hospital relative to the amount of communication that they had received had not been studied.

An increase in client satisfaction and likelihood that the client would return to the clinic was directly correlated with the presence of a structured clinic-initiated follow up program. Clients in Group B also felt that their dog's aggression and anxiety level was decreased more relative to the perception of clients in Group A. This is to be expected considering the ongoing and long-term treatment required for success in cases of fear-related aggression. Even clients who did not respond to the clinic-initiated contacts during the follow-up period still responded with a more positive outcome and satisfaction level at the time of the survey. This may indicate that, although the clients did not respond at the time of the contact, the lines of



communication were open and available, providing a more favorable incentive for clients to contact the behavior clinic staff as needed.

There was no significant difference between the two groups when the number of bites (in the six months following the appointment) or the disposition of the dog was compared. However, it is interesting to note that clients in Group B were still more likely to characterize their dog's aggressive behavior and anxiety level as improved when compared with Group A. The lack of difference in the number of bites may be due to the fact that each client was given a standard safety protocol to avoid or minimize the risk of further bites. We are also aware that dogs in Group A may have manifested more aggression than Group B—by growling, nipping or lunging—without biting, leading their owners to consider their behavior unchanged or worse nevertheless.

Group A clients were more likely than Group B clients to have contacted an outside party for help. This implies that these clients had a need for additional help in order to modify their pet's behavior to their satisfaction. We did not look at why this group of clients contacted an outside party instead of the Behavior Clinic; however, if contact had been initiated with them, they may have been able to gather the information that they needed to improve their pet's behavior without outside help.

Client perception of outcome, client satisfaction rate and willingness to return to the clinic in this group of clients was associated with the initiation of follow-up contacts by the behavior clinic. This suggests that regularly scheduled follow-up communications initiated by the clinician or support staff can lead to a more positive outcome in cases of canine fear-related aggression.

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**Keywords**

*aggression, communication, dog, fear, follow up, satisfaction*

# Objective Measurement of Fear-Associated Learning in Dogs (*Canis familiaris*)

***N. Ogata, Y. Takeuchi\*, T. Kikusui, Y. Mori***

## ***Introduction***

Anxiety and/or fear are two of the main causes of canine behavior problems not only in pet animals but also in working dogs. Objective measurement of particular temperaments such as fearfulness would therefore be important for the evaluation in these fields. There have been several studies on temperament evaluation with behavior tests or with questionnaire surveys to experienced care-takers or ordinary owners (Van der Borg et al. 1991; Weiss and Greenberg 1997; Rooney and Bradshaw 2004). However, because the results of most previous studies were influenced by the expertness of observers and testing environment, it has been difficult to compare one test with another. Few studies have so far focused on the association learning between a cue (conditioned stimulus) and fear (unconditioned stimulus) in dogs, although it is well recognized that this association is the most commonly encountered phenomenon in practice of veterinary behavioral medicine.

In several mammalian species including humans, stress responses are frequently associated with a temporal elevation of body temperature, which is called a stress-induced hyperthermia (SIH) (Korhonen et al. 2000; Zethof et al. 1994). This SIH response is probably mediated by the autonomic nervous system and the involvement of brain corticotropin releasing hormone system is postulated. It has been determined that the SIH is not related to locomotor activity, but reflects the individual anxiety status. In the present study we investigated how dogs responded to a fear conditioned stimulus in terms of SIH and heart rate responses.

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*Laboratory of Veterinary Ethology, The University of Tokyo, Tokyo 113-8657 Japan*

\*Corresponding author: [aytake@mail.ecc.u-tokyo.ac.jp](mailto:aytake@mail.ecc.u-tokyo.ac.jp)

## **Materials and Methods**

The dogs used in this study ( $n = 5$ ) were privately owned pet dogs. There were two males and three females from three different breeds (2 Standard Poodles, 2 Labrador Retrievers and 1 Golden Retriever) approximately two to seven years old. Remote-controlled spray collar “spray commander™” (Multivet International Inc., Saint-Hyacinthe, (Quebec), Canada) was used as the fear evoking stimulus (unconditioned stimulus) and the buzzer noise was used as the conditioned fearful stimulus (conditioned stimulus). The test procedure was divided into four sessions. At the first session, only the buzzer noise was provided. At the second session the buzzer noise and remote-controlled spraying were provided in pairs. Then only the buzzer noise was provided as the conditioned stimulus at the third session. The dogs were exposed to these three sessions in a single day and two weeks later they were exposed to only the buzzer noise again to see the extinction process at the fourth session. Rectal temperature and heart rate were measured at each of the four sessions.

## **Results**

None of the dogs responded to the buzzer noise itself at the first session. In contrast, both the rectal temperature and the heart rate increased significantly at the third session ( $p < 0.05$ , ANOVA), when the buzzer noise was conditioned as the fear stimulus. At the fourth session, in three out of five dogs the rectal temperature increased but with less extent as compared to the third session, and in the other two dogs an increase was not observed.

## **Discussion**

In this study there were considerable individual differences at the second and the third session. At the second session the dogs showed the reaction to the fearful stimulus (spray from the collar), whereas the dogs showed the reaction to the conditioned stimulus (buzzer noise) at the third session. In the previous studies of assessing temperament using behavior tests, various stimuli such as umbrellas, car horns and strangers were used (Van der Borg et al. 1991, Weiss and Greenberg 1997) and the reaction to each stimulus was assessed. It is very important for this kind of test that the stimuli should be various with sufficient intensity. It can be said, however, that they barely reflected the actual environment for dogs. Dogs having behavior problems such as separation anxiety initially show no anxiety to the cues, such as the sound of car keys and owner’s street clothes, until these cues have been paired with owner departures. We, therefore, considered that comparison between the responses at the first session and those at the third session would be reasonable to assess the dog’s temperament, because the first phase could be used as the baseline for evaluating the third phase within the same individual. Some dogs showed rather

strong reactions such as hiding under the table at the second session, which suggests that the test results reflected each dog's sensitivity toward the fearful stimulus.

As different breeds expressed different types of behavioral and autonomic responses, the third session, using only the conditioned stimulus and not the fear evoking stimulus, would be most meaningful. It appears that the involvement of the third session where only the conditioned stimulus, but not the fearful stimulus, would be meaningful.

From the viewpoint of association learning and acclimatization to stress such as a fear related stimulus, the individual response at the third session could be interpreted as the recovery phase response, since the individual differences at the third session may reflect the tolerance and/or coping capacity in each animal. The susceptibility to fear learning must be relevant to the welfare of modern dogs that are surrounded by various novel stimuli. In the research of behavior genetics in humans the association between polymorphisms in certain genes and temperament (e.g., Lesch et al. 1996) have been postulated. It seems likely that canine temperament and individual or among-breed differences of stress tolerance have some kind of genetic background.

Based upon the results that all the five dogs showed autonomic responses such as increases of the heart rate and body temperature at the third session, it is suggested that association learning between conditioned and fearful unconditioned stimuli can be assessed objectively in dogs. After two weeks, at the fourth session, these autonomic responses became smaller, suggesting that the extinction process was going on. It seems likely that the intensity of the fear evoking unconditioned stimulus used in this study was moderate and suitable for this kind of test.

In conclusion, the present results have suggested that the SIH and heart rate would prove themselves useful in diagnosing and investigating the physiological mechanisms underlying various behavior problems. Although this is a preliminary study with small number of dogs, we hope that the method herein described could be applied to our and other groups' future study of behavior genetics in the dog.

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**Keywords**

*anxiety, dog, fear, measurement*

# Canine Aggression: A Survey in Northern Italy

**C. Palestirini\*, M. Michelazzi, S. Cannas, M. Verga**

## ***Introduction***

In the last few years, dog aggression has been increasing both in frequency and in severity, highlighting a world-wide lack of appropriate legislation. The pressure of public opinion amplified through the media has induced governments to issue dog-related laws and regulations in many European countries. Although the laws vary among countries, they often involve restrictions on specific “dangerous” breeds of dogs, without strong scientific support. In many cases, the law doesn’t address responsible pet ownership and education of the public about dog behaviour. Breeding and training aspects are often neglected in the regulations, as well. In Italy, no national statistics are available to track dog aggression so the success or failure of breed-specific legislation will be difficult to assess.

Canine aggression directed toward human beings is a very common complaint and carries with it significant consequences to the owner-animal relationship and public safety. It causes a great deal of emotional distress and requires scrupulous attention to safe management techniques to minimize future risks. For many people, an aggressive animal is automatically also a dangerous one and vice versa. This is, however, not always the case. An animal is “dangerous” when it endangers the physical and/or psychological integrity of a human or other living being (Dehasse 2002). A history of aggressive behaviour is important to consider when evaluating a dog’s potential for being dangerous; however, other factors must be taken into account as well.

It is difficult to form a universally applicable definition of aggression. Generally speaking, it may be defined as behaviour or intent by an organism to injure or

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*Istituto di Zootecnica, Facoltà di Medicina Veterinaria, Università di Milano, Via Celoria 10, 20133 Milano, Italy*

\*Corresponding author: clara.palestrini@unimi.it

otherwise “inflict noxious stimulation” toward another organism (Moyer 1968, 1987). Aggression also may be defined as a behaviour that leads to—or of which the apparent aim is—to do harm to the physical (and/or psychological) integrity or freedom of another individual (Eibl-Eibesfeldt 1995; Dehasse and Cornet 2003). The word “aggression” refers to a behaviour sequence in a certain situation and at a certain moment in time, which can be a part of the normal ethogram of a species. For example, aggressive behaviour not stemming from idiopathic or pathological causes can be viewed as an adaptive effort to establish control over some vital resource or situation that cannot be effectively controlled through other means (Dehasse 2002). Behaviour is a consequence of genetic predisposition, learning and environmental interactions. The aim of this research is to better understand human-directed canine aggression in Italy and its relationship with some individual and environmental features.

### ***Materials and Methods***

Records describing dog bites ( $n = 10,716$ ) were collected between 1999 and 2003 from 24 different Italian Local Health Authorities (ASL) in several regions of northern Italy (Lombardia, Emilia-Romagna, Piemonte, Liguria). The data collected included the sex, age, breed, and body size of the biting dogs; the target of aggression (family member or stranger); the sex and age of the victims; the location of the bite wounds; and the year and month of the incident. The dogs’ breeds were classified according to ENCI (Ente Nazionale Cinofilia Italiana), with the addition of Group 11 for pit bulls, which are not recognised by ENCI as a breed, and Group 12 for mixed breeds.

### ***Results***

In our sample, mixed breed dogs and the first two groups of ENCI classification were the most commonly represented dogs. Group 1 includes sheepdogs and cattle dogs, except the Swiss cattle dog. Group 2 includes Pinschers and Schnauzers, molossoid breeds, Swiss mountain and cattle dogs, as well as other breeds. Members of these breed groups include large dogs. These data are also confirmed from the analysis of the dogs’ size, which revealed that large dogs are the most highly represented in ASL’s reports. Most of aggressive events reported involved male dogs; however, the data do not allow the authors to distinguish between intact and neutered animals. Most of the dogs involved in the aggressive episodes were between four and six years of age, with many of them between one and three years of age.

Bites were especially likely to be reported between April to August and were most likely to involve strangers. The contexts for the specific aggressive events were not available. Most of the victims were adults, between 31–60 years of age, and the bites were most frequently delivered to the arms and legs.



## **Discussion**

This study is based on a sample of records collected in only some regions of northern Italy. Due to this fact, the interpretation of reports must be done with caution because of numerous contributing factors. The actual number of aggressive incidents is likely to be much higher than the number reported since many bites are only reported to the authorities only if they require medical attention (Mertens 2000). A study by Guy et al. (2001) indicates that only 9.3% of victims of dog bites that occurred within the family sought medical attention from a physician. This could also explain why most of the victims in the present study were strangers rather than family members or relatives.

These data are in contrast with the literature, which reports that individuals familiar to the dog (family members, friends, or neighbours) are the preferred victims (Mertens 2000). Additionally, most studies find that bites directed towards children are more commonly reported than bites affecting adults (Kizer 1979; Sacks et al. 2000). When children are bitten, the bites are often delivered to the child's face, neck, and head (Jones and Beck 1984; Weiss et al. 1988; Mertens 2000). In the present study, most of the victims were adults between 31 and 60 years of age. Therefore, bites were more frequently reported on the arms and on the legs.

## **Conclusion**

Canine aggression is a growing problem in terms of frequency and severity. This escalation may be related to various factors, including urbanization, a new role for the dog inside the family, breeding and training of aggressive dogs, misinterpretation of canine behaviour and the dog's ethological traits, and irresponsible management of dogs. All breeds have the potential to show aggressive behaviour. Thus there is no logical argument to support the concept of "breed specific" legislation. The laws should, therefore, be aimed at the owner's responsibility rather than at the dog. It is impossible to predict a living being's reactions in every situation and moment, and consequently, it is impossible to give a 100 percent guarantee that an animal is "not dangerous." One must consider as many factors as possible before deciding whether an animal is labelled as dangerous (Dehasse 2002). The correct approach is to comprehensively address the prevention of abnormal dog behaviour rather than focusing purely on aggression. A multidisciplinary approach, with education as a key element, is required.

## **Acknowledgments**

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## Keywords

*aggression, bite, dog, human, Italy, legislation*

# A Comparison of Cases Referred to Behaviorists in Three Different Countries

**S. Denenberg<sup>1</sup>, G. M. Landsberg<sup>2\*</sup>, D. Horwitz<sup>3</sup>,  
K. Seksel<sup>4</sup>**

## **Introduction**

A number of previous studies have evaluated case distribution at behavior referral practices. (Landsberg 1991, 1995; Beaver 1994; Halip et al. 1998) The present study was intended to provide a more recent update of the cases and breeds that are most commonly referred, as well as to compare and contrast practices in 3 different behavior practices in Toronto (Canada), St. Louis (United States) and Sydney (Australia). Data was collected in April 2003 from each practice for the most recent 300 dog (*Canis familiaris*) cases and 75 cat (*Felis sylvestris*) cases.

Although each of the behaviorists is a diplomate of the American College of Veterinary Behaviorists and each practice is in a large urban center, direct comparisons and statistical analysis could not be made as the case records of each practitioner were not designed for comparative purposes and common data was not necessarily available. Yet, despite these limitations, some interesting insight into the state of behavioral medicine can be gained by evaluating the similarities and differences between the three practices. It is clear from this study that diagnostic terminology has yet to be adequately standardized, and that most cases had multiple complaints and diagnoses.

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<sup>1</sup> Ridge Veterinary Hospital, Medicine Hat, AB, T1B 4R2 Canada

<sup>2</sup> Doncaster Animal Clinic, Thornhill, ON, L3T 2K9 Canada

<sup>3</sup> Veterinary Behavior Consultations, St. Louis, MO 63141 USA

<sup>4</sup> Sydney Animal Behaviour Service, Seaforth, NSW, 2092, Australia

\*Corresponding author: gmlandvm@aol.com

## Canine Case Distribution

### Aggression

The most common reason for canine referrals at all three practices was aggression which represented approximately 70 percent of all referrals at each practice (Table 1). Of all aggressive cases, 70 percent at the Canadian site, 55 percent at the U.S. site, and 57 percent at the Australian site were male. At the time of referral over 95 percent of both males and females at the Canadian and U.S. sites and over 90 percent of both males and females at the Australian site had been neutered. At the time of presentation about one-third of the cases were under two years of age, approximately one-half of all cases were between two and 7 years of age and about 10 percent of cases were over the age of seven (Table 1).

Table 1. Distribution of canine cases by clinical presentation and sex: (n = 300)

	Canada	Australia	USA
Aggression	210 (M-146, F-64)	213 (M-121, F 92)	211 (M-117, F-94)
Anxiety	63 (M-22, F-30)	43 (M-25, F-18)	66 (M30, F-36)
Separation anxiety	27 (M-16, F-11)	41 (M-20, F-21)	57 (M-24, F-33)
Fear/Phobia	28 (M-12, F-16)	68 (M-43, F-25)	12 (M-7, F-5)
Housoiling	29 (M-15, F-14)	16 (M-8, F-8)	20 (M-11, F-9)
Unruly	17 (M-10, F-7)	15 (M-5, F-10)	14 (M-9, F-5)
Repetitive / OCD	15 (M-12, F-3)	12 (M-4, F-8)	7 (M-4, F-3)
Destruction	15 (M-12, F-3)	4 (M-2, F-2)	1 (M-1)
Cognitive dysfunction	5 (M-4, F-1)	5 (M-1, F-4)	8 (M-2, F-6)
Bark	3 (M-3)	29 (13 M – 16 F)	1 (M-1)
Misc. e.g. roam, escape	17 (M-12, F-5)	33 (M-15, F-18)	1 (M-1)

While the percentage of mixed breeds was approximately equal for all three practices (approximately 25% of aggressive cases), there were both similarities and differences in distribution of purebred cases. This is to be expected since breed popularity varies greatly between countries and regions, as well as from year to year. In addition the dogs at the two North American practices would likely be somewhat genetically different from those at the Australian practices due to both distance and import restrictions. As expected, the U.S. and Canadian practices showed greater similarity with eight of ten breeds in common, while there were only five breeds in common to all three sites (Jack Russell Terrier, Golden Retriever, Cocker Spaniels<sup>1</sup>, German Shepherd and Dalmatian). (Table 2)

1. At the Canadian site Cocker Spaniels not differentiated between American and English and have therefore been combined.

Table 2. Aggression cases by breed

	Canada	Australia	USA
	Mix breeds 52	Mix Breeds 60	Mix breeds 57
1	Jack Russell Terrier 15	German Shepherd 15	German Shepherd 11
2	Golden Retriever 13	Border Collie 11	Labrador Retriever 9
3	Labrador Retriever 10	Jack Russell Terrier 9	Golden Retriever 9
4	S. C. Wheaten Terrier 8	Miniature Poodle 9	Bichon Frise 7
5	Engl. Springer Spaniel 7	Rottweiler 7	Australian Shepherd 7
6	Doberman 7	English Cocker Spaniel 6	English Cocker Spaniel 6
7	^Cocker Spaniels 6	Dalmatian 6	Engl. Springer Spaniel 6
8	Bichon Frise 5	American Staffordshire 5	West Highland Wt. Ter. 5
9	Dalmatian 5	Australian Kelpie 5	Dalmatian 4
10	German Shepherd 5	Golden Retriever 4	Jack Russell Terrier 4

In Canada and the United States the order was similar for six of the breeds Golden Retriever, Labrador Retriever, English Springer Spaniel, ^Cocker Spaniel, Bichon Frise, and Dalmatian, while the Jack Russell Terrier was most common at the Canadian site with the German Shepherd tenth and this was reversed at the U.S. site. Two breeds on the Canadian list, Soft Coated Wheaten Terriers and Dobermans did not appear on the U.S. list, while the Australian Shepherd and West Highland White Terrier were on the U.S. list but not the Canadian. The miniature poodle, Rottweiler, Border Collie, American Staffordshire and Kelpie were amongst the 10 most common in Australia but not in Canada or the U.S. By comparing the breed distribution at each practice with breed popularity some interesting observations might be made. In Canada, the Jack Russell Terrier, English Springer Spaniel, Doberman and Dalmatian were amongst the 10 most common referred for aggression, but were not in the top 20 for breed popularity. In the U.S. the Bichon Frise, Australian Shepherd, English Springer Spaniel, West Highland White Terrier, Dalmatian and Jack Russell Terrier were in the top 10 for aggression but not the 20 most popular. In Australia, the Dalmatian and Kelpie were amongst the 10 most commonly referred for aggression that was not in the top 20 for popularity. The Labrador Retriever and Cavalier King Charles Spaniel in Australia, the Toy Poodle and Shetland Sheepdog in Canada, and the Beagle and Daschund in the U.S. were amongst the most popular but not commonly seen for aggression (Table 3).

Table 3. Most common breeds as reported by kennel clubs in 2002/2003

	<b>Canadian Kennel Club</b>	<b>Australian Kennel Club</b>	<b>American Kennel Club</b>
1	Labrador Retriever	Labrador Retriever	Labrador Retriever
2	Golden Retriever	Staffordshire Terrier	Golden Retriever
3	German Shepherd	German Shepherd	Beagle
4	Toy Poodle	Golden Retriever	German Shepherd
5	Shetland Sheepdog	Cavalier King Charles	Dachshund
6	Miniature Schnauzer	Border Collie	Yorkshire Terrier
7	Yorkshire Terrier	Boxer	Boxer
8	Beagle	Rottweiler	Toy Poodle
9	Bichon Frise	English Cocker Spaniel	Shih Tzu
10	Shih Tzu	Jack Russell Terrier	Chihuahua
11	Boxer	Pug	Miniature Schnauzer
12	Bernese Mountain Dog	Beagle	Pug
13	Pomeranian	Toy Poodle	Pomeranian
14	S.C. Wheaten Terrier	Dachshund	English Cocker Spaniel
15	American Cocker Spaniel	Chihuahua	Rottweiler
16	Rottweiler	Australian Cattle dog	English Bulldog
17	English Cocker Spaniel	Miniature Pinscher	Shetland Sheepdog
18	Pug	West Highland Wt. Ter.	Boston Terrier
19	Siberian Husky	Maltese	Miniature Pinscher
20	Miniature Pinscher	Shetland Sheepdog	Maltese

In attempting to compare the types of aggression at each practice, a variety of terms were utilized making comparison difficult (Table 4) Aggression toward strangers which for the most part was motivated by fear and anxiety was by far the most common reason for referral representing about 60 percent of aggression cases. However, many dogs exhibited aggression in more than one context and it was not possible to determine which type of aggression was the primary reason for seeking guidance. Aggression toward family members related to petting, handling or dominance related contexts was seen in 26 to 38 percent of cases. Possessive aggression of food and other favored objects ranged from 16 percent of U.S. cases to 36 percent of Canadian cases. Dogs that were defensive or protective of the household or owners comprised between 20 and 35 percent of all aggressive cases. Aggression toward other dogs was seen in 28 to 37 percent of cases.

Table 4. Distribution of Aggression cases (Multiple diagnoses for some dogs)

Total cases	Canada 210	Australia 213	USA 211
Strangers: Fear/anxiety	132 (63%)	121 (57%)	124 (59%)
Owners: Dominance/petting/handling	61 (29%)	80 (38%)	55 (26%)
Possessive – food bowl/other resources	76 (36%)	49 (23%)	34 (16%)
Territorial/protective	42 (20%)	75 (35%)	60 (28%)
Intra-species	58 (28%)	78 (37%)	60 (28%)
Play	20 (10%)	6 (3%)	9 (4%)
Redirected	8	5	5
Predation / Chase	13	7	4
Medical	1	4	3
Kangaroo		1	

### Other problems

Approximately 30 percent of cases at each practice had presenting complaints that did not include aggression (Table 1) Anxiety, on its own or as a component of other problems was diagnosed in 14 to 21 percent of cases. Separation related behavior problems ranged from nine percent of Canadian cases to 19 percent of U.S. cases. Fears and phobias were seen as a presenting complaint in 23 percent of Australian cases but only nine percent of Canadian and four percent of U.S. cases. Housesoiling was a primary complaint in five to 10 percent of cases, while destructiveness ranged from one percent of the U.S. and Australian cases to 5 percent of Canadian. Unruly behaviors were diagnosed in about 5 percent of the cases at each of the three practices while compulsive disorders (CD) were diagnosed in two to five percent of all cases and cognitive dysfunction syndrome was diagnosed in two to three percent. One noticeable difference was that barking represented almost 10 percent of all cases in Australia but only 1 percent or less of cases in the two North American practices.

### Feline case distribution

Of 75 referred feline cases, the most common complaint at referral at each practice was inappropriate elimination. (Table 5) In Toronto 60 percent of cases included a complaint of housesoiling and 25 percent of all cases had a marking component. In Australia housesoiling represented 48 percent of the referred cases and nine percent were marking. In the United States housesoiling represented 67 percent of the cases and 19 percent were marking.

Table 5. Feline Distribution of cases by clinical presentation (n = 75)

	Canada	Australia	USA
Aggression	31 MN22, M1, FS8	30 M1, MN17, FS12	23 MN17, FS6
CD e.g. hyperesthesia, overgrooming, pica)	7 MN5, FS1, F1	17 MN12, FS-5	7 MN4, FS3
Elimination	45	36	50
Marking	19 MN10, M1, FS8	7 MN5, FS2	14 MN10, FS4
Housesoiling	26 MN11 FS15	30 MN20, FS10)	36 MN19, FS16, F1
Marking + Soiling	10	2	5
Anxiety (often a component of other problems)	22 M1, MN12, FS9	18 (M1, MN9, FS8)	10 MN3, FS7
Misc. e.g. vocal, waking	1 vocal / wake (senior)	10 vocal (2 senior)	
Medical	6 M1, MN1, FS4	3 MN1, FS2	1 FS1

M = male, MN = male neutered, FS = female spayed

The next most common complaint was aggression, ranging from 31 percent (U.S.) to 41 percent (Canadian) of referred cases. Of the aggression cases, the most common type was intraspecific ranging from 39 percent of cases in the U.S. to 70 percent in Australia. (Table 6).

Table 6. Distribution of Feline Aggression Cases

	Canada (31)	Australia (30)	USA (23)
Intercat	18 (58%)	21 (70%)	9 (39%)
Play / Predatory	12 (16%)	8 (11%)	6 (8%)
Redirected	9 (29%)	7 (23%)	4 (17%)
Fear / Anxiety	9 (29%)	3 (10%)	4 (17%)
Territorial	8 (26%)	3 (10%)	4 (17%)
Status	6 (19%)	9 (30%)	1 (4%)
Petting	1 (3%)	1 (3%)	2 (8%)

Perhaps of note is that in previous studies inappropriate elimination represented about 70 percent of referred cases (Beaver et al. 1989, Halip et al. 1998) and aggression about 15%, reflecting perhaps a trend toward an increase in aggression



cases amongst housecats or a decrease in the referral of elimination cases as practitioners perhaps become more comfortable with treating these problems. Compulsive disorders represented 7 percent of all cases in Canada and the U.S. and 23 percent of cases in Australia. Anxiety, although often a component of other behavioral problems was a presenting complaint in 30 percent of all cases in Canada, 24 percent of all cases in Australia and 13 percent of cases in the U.S. One additional comment is that in Canada 21 of the housesoiling cats were declawed and 19 of the aggressive cats had been declawed. By comparison, in Australia where no cats had been declawed, the prevalence of housesoiling and aggression was similar to that seen at the Canadian site.

## **Conclusion**

The similarities and differences in case distribution between behavior referral practices in different geographical areas can provide valuable insight into the scope of problems that practitioners may need to refer as well as the ages, breeds and sex that are most commonly presented. Caution must be exercised in evaluating this data since these cases represent only those that are referred to veterinary behaviorists. In fact, many other pet owner complaints may be far more common (e.g. overexcitement and jumping up in dogs) but are less likely to require a referral consultation. (Kobelt et al. 2003). In addition, while this study identifies those breeds that have been referred for problems, they do not necessarily reflect the prevalence of a problem within a breed.

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## **Keywords**

*aggression, breed, caseload, cat, distribution, dog*

# Canine Behaviour Type Index

**K. Dagley\*, J. Perkins**

## **Introduction**

While working intensively with companion dogs (*Canine familiaris*) it emerged that certain behavior types present particular management challenges in a domestic setting. Gosling and colleagues validated the concept of dogs having a distinct measurable personality type (Gosling et al.). Our team (Pet Connect) decided to research a method of characterizing a dog's personality, and to produce a management and training schema for each personality type. This schema would enable dog lovers everywhere to access information to understand and solve their dog's behaviour problems, or to simply have a better understanding of their canine companion. The Canine Behaviour Type Index™ (Patent pending) divides dog behaviour into 12 types (Table 1) based on three dimensions of interactive factors: (1) Environmental Order (either Organized or Spontaneous); (2) Social Order (either Alpha, Beta, or Gamma); (3) Motivation (either Medium or High) giving 12 possible outcomes.

Table 1. Twelve personality types

Commando (OAH)	Director (OAM)	Defender (OBH)
Sentry (OBM)	Deputy (OGH)	Diplomat (OGM)
Rebel (SAH)	Aristocrat (SAM)	Adventurer (SBH)
Dreamer (SBM)	Investigator (SGH)	Companion (SGM)

## **Materials and Methods**

Questions were administered to 50 volunteer pet dog owners with one to three dogs each. Each owner played a board game in solitude. The board game has twenty-six

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*GOOD DOG Behaviour Clinics, Australia*

\*Corresponding author: ken.dagley@bigpond.com

two-sided cards with opposing statements about the dog. The owner selects the most appropriate statement about their dog. There were nine cards for each of the Environmental Order and Motivation dimensions, and eight for the Social Order dimension. The Canine Behavior Type Index (CBTI) was decided according to a majority of answers, then the corresponding CBTI printed profile given to the owner. The owner filled in a questionnaire about the perceived accuracy of the CBTI printed profile to their companion dog. The person administering the test was a veterinary behaviorist who also typed each dog independently of the owner based on behavioral questions and observations.

## **Results**

In preliminary statistical analysis, the owner perceived accuracy ranged from 70–100 percent. The correlation between the owners and the researcher's selected CBTI type is  $P < 0.01$ .

## **Discussion**

The CBTI recognizes that certain canine psychological profiles best suit specific tasks and lifestyles. A behavior management plan was tailored to meet the specific needs of each CBTI profile. Each dog requires exercise, deference, environmental enrichment, rapport and respect exercises, though the relative importance and style of each exercise depends on the dog's CBTI profile. The CBTI is not breed specific though breeds may cluster around particular profiles. Several precautions regarding the profiling should be considered. These precautions are as follows: (1) When a dog becomes depressed it can be expressed as an increase in irritability and anxious activity, unlike humans who typically become withdrawn and reduce activity levels. The neurochemical changes occurring in depressed humans and dogs are thought to be similar. If your dog changes from a Medium activity type to a High activity type, perhaps all is not well and help from a local Veterinary Behaviorist should be sought. (2) Dogs under 3 years old (or 5 in cases of late social maturity) may need to be profiled each 6 months because their personality is still forming. (3) In cases of abnormal brain function or a psychiatric condition, the test may need to be re-taken at regular intervals and after treatment. (4) Dogs' personality may change with senescence (old age). (5) Breeds tend to cluster around specific profiles, because they have been selectively bred for specific purposes. People often prefer a particular breed for its character, hence they continue to select the same breed with a similar personality profile.

**Reference**

Gosling, S D Kwan V S Y, John O P, 2003 A Dog's Got Personality: A Cross-Species Comparative Approach to Personality Judgments in Dogs and Humans  
*Journal of Personality and Social Psychology* 85: 1161–1169

**Keywords**

*behavior, dog, measurement, personality*

# Canine Cognitive Dysfunction: Prevalence, Clinical Signs and Treatment with a Nutraceutical

**M. C. Osella\***, **G. Re**, **R. Odore**, **C. Girardi**, **P. Badino**,  
**R. Barbero**, **L. Bergamasco**<sup>2</sup>

## **Introduction**

Aging represents a complex biological process characterized by a progressive modification of tissues and cells (Kiatipattanasakul et al. 1996), which results in the decreased ability to maintain homeostasis; animals can show a decrease in their physical and cognitive performance (Landsberg and Ruehl 1997). In aged dogs behavioural problems are often related to organic and functional disorders (Houpt and Beaver 1981) and are often referred to manifestations of the “aged dog syndrome” or, when severe, of “senile impairment” or, sometimes, they are considered as features of “normal aging”.

A serious impairment of the cognitive processes has to be distinguished from a simple and mild decrease of the psychomotor activity and may be considered as “pathological aging.” As well as in man, where different levels of aging and dementia have been documented, the “canine cognitive dysfunction syndrome” (CCDS) of the senior dog has recently been described (Ruehl et al. 1995). The CCDS shares some commonalities with Alzheimer’s disease (AD) of man and is characterized by

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<sup>1</sup>*Dipartimento di Patologia Animale, Sezione di Farmacologia e Tossicologia, Facoltà di Medicina Veterinaria, Università degli Studi di Torino, Via Leonardo da Vinci 44, 10095 Grugliasco, Italy*

<sup>2</sup>*Dipartimento di Morfofisiologia Veterinaria, Sezione di Fisiologia ed Etologia, Facoltà di Medicina Veterinaria, Università degli Studi di Torino, Via Leonardo da Vinci, 10095 Grugliasco, Italy*

\*Corresponding author: osellamc@aliceposta.it

brain modifications that negatively modulate the interaction of dogs with their own environment (Cummings et al. 1996).

In human medicine a variety of neurotransmitter abnormalities have been described in patients affected by age-related dementia. Also in some laboratory species, old animals show modifications of neurotransmitter levels and of their receptor concentrations. In particular, a decrease in the central nervous system (CNS) dopamine and dopamine receptor (D2) levels has been described. Nevertheless, these modifications are often associated with specific diseases related to aging and their involvement in the pathogenesis of age-related cognitive dysfunction has not been fully elucidated (Rehman and Masson 2001). Furthermore, in some primates affected by cognitive dysfunction a significant decrease in brain catecholamine (norepinephrine, dopamine) levels has been observed (Arnsten 1993). In AD the hypothalamic concentration of norepinephrine is reduced (Palmer 1996).

The serotonergic system seems to be involved in the physiological process of aging and in the pathogenesis of AD. In fact, the CNS serotonin levels decrease with age and in AD a significant decrease of the neurotransmitter and of some metabolites has been observed in the CNS and in the cerebrospinal fluid (Baker and Reynolds 1989; Reinikainen et al. 1990; Tohgi et al. 1992). The change in serotonin levels has been associated with modifications of serotonin receptor concentrations (Lai et al. 2002). It has been suggested that platelets represent a suitable peripheral marker of central serotonergic activity since in AD subjects there is a significant decrease of central and platelet serotonin concentrations (Kumar et al. 1995; Inestrosa et al. 1993).

Neurotransmitter catabolism is mainly regulated by monoaminooxidases (MAO). Some authors have demonstrated that in old patients the brain MAO-A levels are not significantly different from adults, whereas an age-related increase in MAO-B has been reported (Fowler et al. 1980) and AD is characterized by an increased MAO-A and MAO-B activity in the frontal cortex (Emilsson et al. 2002) and in platelets. It has long been recognized that aging and some age-related diseases such as AD are characterized by alterations of the cholinergic system (Rehman and Masson 2001); in the brain a decrease in muscarinic receptors (MR) and acetylcholinesterase activity occurs (Rinne 1987).

The oxidative stress plays a pivotal role in the neurodegenerative processes associated with age-related dementia (Anderson et al. 2001). In the plasma and erythrocytes of mild cognitive dysfunction and AD patients a decrease of superoxide-dismutase (SOD) activity has been observed as well as decreased blood concentrations of vitamin A, C, E and glutathione peroxidase (Rinaldi et al. 2003).

The CCDS is quite common among senior dogs and the typical behaviour changes in the affected animals include signs of disorientation, a decrease or alteration of social interactions, impairment of the normal housetraining, changes in the usual sleep-wake cycle and general activity (Ruehl and Hart 1998).

For both man and dog it is necessary to know the main pathogenetic mechanisms of aging to formulate a precise diagnosis and to establish successful treatment protocols in order to manage geriatric behavioural problems. Furthermore, many neuropathological processes are common to man and dog making the latter a suitable model for the study of human aging and dementia (Ruehl et al. 1995). Differentiating normal from pathological aging is a challenge to veterinarians, since the progressive decline of canine CD leading to functional impairment and eventually death may be greatly underestimated.

The aims of this study were to develop a questionnaire for the early detection of CD in practice and to evaluate the use of a nutraceutical (Senilife<sup>®</sup>, Innovet Italia s.r.l., Rubano, Italy) throughout a prospective open-label clinical trial.

### **Materials and Methods**

Initially the animals were recruited among the geriatric population not referred for behavioural consultations to the Hospital of the University where the authors practice. A questionnaire with a checklist of behaviours (Landsberg and Ruhel 1997; Ruhel and Hart 1998) was filled out to evaluate some behavioural signs grouped in the following categories: disorientation (D), socio-environmental interaction (I), sleep-awake cycles (S), housesoiling (H), general activity (A). Inclusive criteria were males and females, all breeds and mix breeds, age >7 years old, exclusion criteria were primary organ failure and/or neurological signs, and living with the owner for less than one year.

On the basis of the results of this survey, the clients with dogs at risk for CD were counselled to make a behavioural consultation, and among the animals referred eighteen dogs resulted with a diagnosis of cognitive dysfunction syndrome (CDS). According to the investigator's judgment and the owners' agreement, eight dogs with a diagnosis of CD were enrolled for the second step of the project, that is the Senilife<sup>®</sup> trial. At V<sub>0</sub> the owners were briefed verbally about the procedure and Senilife<sup>®</sup> was delivered (dosage: 1 capsule/5 Kg PO); no behavioural advertisement was given throughout the study time. At V<sub>0</sub>, V<sub>1</sub> (28 ± 3 days), V<sub>2</sub> (56 ± 3 days) and V<sub>3</sub> (84 ± 3 days) a control visit was performed and the owners were interviewed. The investigator referred to a questionnaire and asked the owners to rate the frequency of each question on a four point frequency scale (never, rarely, often, always) besides an overall assessment including all the signs rating of each category of signs on a five point change scale (much better, slightly better, the same, slightly worse, much worse); the owners were asked to rate their satisfaction with the treatment using a four point degree scale (very satisfied, satisfied, dissatisfied, mainly dissatisfied) at V<sub>1</sub>, V<sub>2</sub> and V (Landsberg and Ruhel 1997).

Statistically an exact percentage confidence interval test (SAS System, Version 8) was applied.

## **Results**

One hundred and twenty-four dogs were tested in the survey of the first step; twenty-seven resulted at the level of successful ageing, forty-two with alterations just in one category and fifty-five with signs associated to 2 or more categories. The eight cases with CDS enrolled in Senilife<sup>®</sup> trial showed a highly significant difference in  $V_3$  versus  $V_0$ , in all the categories as well as the in overall assessment ( $p < 0.001$ ), even if some items didn't significantly differed if analysed singularly.

## **Discussion and Conclusions**

The questionnaire applied in the first step of the project is not a validated scale for CDS as a specific diagnosis (Pageat 2001), but it might be suggested for a preliminary global geriatric screening for CD in practice. It revealed itself as a useful tool for early detecting emotional and cognitive behavioural alterations due to senility. The questionnaire was easy and quick to fill out, and the veterinarian could readily decide if it would be necessary to examine the case in detail or to refer it to an expert. The product was successful in the owners' degree of satisfaction, perhaps because it doesn't present the side effects and the contraindications of some psychotropic drugs, especially in the older patient.

The preliminary results of the present trial on Senilife<sup>®</sup> showed a marked improvement of CDS related signs, even if the dogs didn't show the complete symptoms remission but rather an enhanced copying age-related.

The dogs selected for Senilife<sup>®</sup> trial were animals presenting a CCDS with mild cognitive impairment. It should be highlighted that our definition of "mild impairment" is quite empirical, since it was assessed in the visit and through the questionnaire; the traditional distinction used in humans for dementia is not directly applicable in animals without further experimentation, that is correlating behavioural, emotional and cognitive measured signs with biological markers, post-mortem brain lesions and the results of special performances of visual-spatial tasks instead of the human batteries of neuropsychological tests.

Senilife<sup>®</sup> is a nutraceutical with ginkgo biloba, vitamins E and B6, and phosphatidylserine, specially formulated to sustain the aging related signs. In fact a possible treatment to protect the cells from the neurodegenerative processes of brain aging is represented by the administration of phosphatidylserine (PS) and Ginkgo Biloba (EGb) extracts (Crook et al. 1992; Le Bars et al. 2002). PS is a phospholipide associated to membrane integral proteins, such as enzymes, receptors, ion channels, which regulates the fluidity of neural membranes which is normally reduced during aging (Tsakiris and Deliconstantinos 1984). In aged and AD patients PS can also restore some neurotransmitter function. In particular it stimulates the hypothalamic dopaminergic system (Bonetti et al. 1987) and restores the age-related decreased brain muscarinic receptor levels (Gelbmann and Muller 1992). The glycosidic flavonoids and terpenoids (bilobalides) of EGb are responsible for the anti-



inflammatory and anti-oxidant effects and protect neural membranes by inhibiting the oxidation of phospholipids (Maclennan et al. 2002). Furthermore, EGb seems to inhibit MAO activity increasing catecholamine and serotonin levels (Sloley et al. 2000).

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**Keywords**

*ageing, cognition, dog, nutraceutical, treatment*

# Nutritional Supplementation in Cases of Canine Cognitive Dysfunction: Results of a Clinical Trial

S. E. Heath<sup>1\*</sup>, S. Barabas<sup>2</sup>, P. G. Craze<sup>3</sup>

## Introduction

Canine cognitive dysfunction is a clinical condition, which is primarily identified by behavioural changes in the aged patient (*Canis familiaris*). It is a neurodegenerative disorder resulting in a decline in higher brain functions, including those involved in memory and learning. It is believed to resemble Alzheimer-type dementia in humans in both its symptomology and pathophysiology (Cummings et al. 1996). In human medicine, single mono-ingredient supplements have proven successful in aiding symptoms that are normally associated with Alzheimer's and it has been hypothesised that nutritional manipulation can also be used in the management of the canine condition (Milgram et al. 2000, 2001).

## Materials and Methods

This trial was designed to investigate the therapeutic effects of a specific nutritional supplement when compared to placebo and cases were recruited from a clinical population. The diagnosis of canine cognitive dysfunction was based on clinical signs in the categories of disorientation, changes in social interaction, changes in sleep-wake cycle and alterations in previously conditioned behaviours (Landsberg et al. 1997). It was a randomised, multi-centred, double-blinded, placebo controlled clinical trial and the stated inclusion criteria were as follows:

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<sup>1</sup> Behavioural Referrals Veterinary Practice, Chester, UK

<sup>2</sup> VetPlus Ltd, Lytham St Anne's, UK

<sup>3</sup> University of Plymouth, Plymouth, UK

\*Corresponding author: heath@vetethol.demon.co.uk

- Dogs over 8 years of age
- Been in the owner's possession for at least two months
- Been displaying signs of cognitive decline for at least one month
- Male or female
- Neutered or entire
- Any breed
- The dog must display behavioural symptoms of cognitive dysfunction
- Those signs must include those associated with disorientation

In addition the dog must show signs from at least one of the following categories:

- Changes in social interaction
- Changes in sleep/wake cycle
- Alterations in house soiling incidents

Cases were excluded from the trial according to the following exclusion criteria:

- Dogs displaying signs of clinical disease on veterinary examination
- Dogs showing abnormal results on routine haematology or biochemistry
- Dogs receiving current treatment in relation to old age behaviour change e.g. selegiline hydrochloride, nicergoline, propentofylline, nutritional supplements or specific prescription diets for control of the symptoms of old age.
- Dogs exhibiting any behavioural problems relating to disorientation, social interaction, sleep patterns or house training prior to 8 years of age
- Dogs showing an appreciable level of aggression toward people which has already resulted in physical injury however minor or has caused the owners reasonable concern that physical injury may occur.

The trial was conducted through 20 UK veterinary practices giving reasonable geographical spread across the country. 24 dogs were enrolled in the placebo group and 20 in the treated group which received the product Akitvait® (VetPlus Ltd, Lytham St Anne's UK). Owners were asked to record the administration of the capsules together with the incidents and severity of the behaviours indicative of cognitive dysfunction over a 56-day period, using a daily questionnaire. A baseline score for each dog was established after a 7-day pre-trial assessment. This was followed by administration of Akitvait® or placebo for 42 days. Finally there was a further 7-day post trial assessment without administration of capsules. During 56 days the owners attended five face-to-face and two phone consultations.

Daily objective scores relating to actual behaviours indicative of canine cognitive dysfunction were recorded. These scores included:

- Number of incidents of lack of recognition of people, other animals or places per day
- Number of incidents of altered social interaction from to toward the dog per day
- Number of nights per week that the dog displays restless or broken sleep patterns
- Number of incidents of inappropriate toileting behaviour per week
- Number of locations used for inappropriate toileting
- Number of substrates used for inappropriate toileting

In addition to the daily scores, global scores of each criterion (disorientation, social interaction, sleep patterns and house soiling) were also recorded on days -7, 0, 10, 21, 28, 42 and 49. These were subjective assessments of each of the behavioural criteria by both the veterinary surgeon and the owner. Overall assessment questions were also asked to both the owner and the veterinary surgeon or nurse relating to overall improvement of behavioural symptoms relative to day 0 of the trial, improvement in the pet-owner relationship and improvement in the pet's quality of life.

## **Results**

The main analytical method used was repeated-measures ANOVA. Unless otherwise stated, variances were homogeneous (as tested by Box's M) and residuals were always approximately normally distributed. The daily scores for each category were analysed after the removal of severe outliers, as identified using standardised residuals and Cook's distance. The data used in the analyses were the differences compared to pre-trial week for the daily scores and the first day of the trial for all of the other measures. A total of 16 out of 20 placebo cases and 11 out of sixteen treated cases produced data that was useable in the analysis.

For the Global Assessment Scores, the data were coded on a numerical scale:

Insignificant = 0 Mild = 1 Significant = 2 Moderately severe = 3 Very severe = 4.

For the questions to the owner and the vet/nurse, data were again coded into a numerical scale:

Significant improvement = 3 Moderate improvement = 2 Mild improvement = 1

Unaffected = 0 Mild deterioration = -1 Severe deterioration = -2

There were statistically significant differences in the response between the treated and the control groups in relation to daily scores for recognition ( $p = 0.040$ ) and sleep patterns ( $p = 0.012$ ).

At the start of the trial all dogs were sleeping for 7 hours during the day. The analysis of the daytime sleep pattern scores (after removal of outliers) showed that dogs receiving treatment were likely to be active for an extra two hours per day—an improvement of 30% while those dogs receiving placebo showed very little altera-

tion in their daytime sleeping pattern and slept for only 8 minutes less by the end of the trial.

Analysis of the daily scores for recognition behaviour showed that the number of incidents of lack of recognition in dogs receiving treatment were decreased from two to one incident per day while those dogs in the placebo group which showed two incidents per day at the start of the trial showed a reduction of one incident every third day.

Global assessment scores were analysed for improvements in disorientation, social interaction, sleep patterns and housetraining and in addition they were analysed in a combined form, with the component scores being added together. Statistically significant differences in the response between the treated and placebo groups were recorded for social interaction ( $p = 0.011$ ) and house soiling ( $p = 0.038$ ).

The house training global assessment revealed that at the start of the trial the average level of house training problems in the treated group was significant while the average level in the placebo group was mild. By the end of the trial the average level in both group was mild which represented a significant decrease in the group.

The combined global assessment score was also statistically significant between the two groups ( $p = 0.007$ ).

Owners and veterinary surgeons were asked to record the overall improvement in age related behaviour and quality of life while owners were asked to make an additional assessment relating to their relationship with the dog. In addition they were analysed in a combined form, with the component scores being added together to give an overall improvement as assessed by vets and by owners.

The perceived changes in behaviour as assessed by the owners' overall assessment questions revealed statistically significant differences between the two groups in relation to age related behaviour ( $p = 0.020$ ), quality of life ( $p = 0.008$ ) and the relationship between dog and owner ( $p = 0.014$ ) while the overall assessment by the veterinary surgeon or nurse also showed significant differences in relation to age related behaviour ( $p = 0.008$ ) and quality of life ( $p = 0.004$ ).

All other measures showed a non-significant difference in response between the treated and placebo groups.

## **Discussion**

There has been increasing interest in the role of nutrition in the treatment of age related progressive degeneration of the central nervous system and in the clinical consequences of that process. In particular research has looked at the effects of dietary manipulation on canine short-term memory and has assessed this with reference to particular learning and memory tasks (Milgam et al. 2000, 2001). This is particularly significant in relation to treatment of canine dementia since loss of short term memory is known to be one of the first indications of cognitive dysfunction in humans (Head 2001). Milgram and colleagues found that cognitive performance could

be improved with a diet supplemented with a broad spectrum of antioxidants, and that the effects occurred relatively rapidly after beginning treatment with a prescription diet. They also found that the improvement related to the test food was clearest in the most difficult cognitive tasks. Antioxidants are therefore believed to prevent the development of the age-related neuropathology, which is implicated in cases of canine dementia. In addition antioxidants are believed to promote recovery in neurons that are exhibiting signs of neuropathology and therefore nutritional manipulation is believed to offer another option in the treatment of canine cognitive dysfunction. In this study the use of a nutritional supplement rather than an alternative diet was investigated and resistance from owners of older dogs to alteration in their diet increases the clinical relevance of such of a study.

### **Conclusion**

In this multi-centred, double-blinded placebo controlled study Akitvait® was shown to aid the management of dogs suffering from cognitive dysfunction behavioural symptoms. This is the first canine nutraceutical to be scientifically proven in this expanding field.

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### **Keywords**

*Alzheimer's, cognition, dementia, disorientation, dog, nutraceutical*



# Comparison of the Behaviour of Three Groups of Chickens (*Gallus domesticus*) during Their Growth: Preliminary Results

**I. Madec<sup>1\*</sup>, D. Saffray<sup>1</sup>, J. F. Gabarrou<sup>2</sup>, C. Lafont<sup>1</sup>,  
L. Bougrat<sup>1</sup>, J. Gigante<sup>1</sup>, P. Pageat<sup>1</sup>**

## **Introduction**

Understanding animals' behaviour is especially challenging in farm animals. Concerning poultry, the large number of individuals, prohibits the performance of specific observations. Classical behavioural tests are too time consuming (Campo et al. 2000). Our goal was to find a way to observe known consequences of different disturbances to conclude on a specific related range of behaviour. In this way, straightforward tests would be able to be performed by numerous persons (i.e. technicians, behaviourists, breeders). In poultry, two main ranges of behaviors are referenced. The first one is fear, characterised by immobility (Gallup 1977), and the second one is stress, characterized by several factors, such as the heterophil over lymphocyte ratio (HLR) (Puvaldolpried and Thaxton 2000). Because we believe that the management of farm animals is very different from birds in natural conditions (Dawkins et al. 2004) we introduced another kind of parameter, which was called "atmosphere" (i.e. comparing natural conditions to classical rearing husbandries). To this aim, different treatments were compared: adoptive hens (fake or real) and putative maternal pheromone. This experiment was intended to study the relationship between physiological criterion and behavioural observations, in different atmospheres.

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<sup>1</sup>Phérosynthèse, Le Rieu Neuf, 84490 Saint Saturnin Apt, France

<sup>2</sup>ESA Purpan, 75 voie du TOEC, 31076 Toulouse, France

\*Corresponding author: imadec@wanadoo.fr

## **Materials and Methods**

Three groups (in three separate, similar buildings) of chickens were bred. In each building, three crates were composed of 40 chicks each at a stocking density of 14 heads/m<sup>2</sup>. The first group (pheromone or P) and the second group (control or C) were bred the same way. In the first crate, we introduced four non mobile fake adult hens (named “mother”) represented by soft plastic toys resembling lying hens. In the second crate, the same fake adult hens were provided, but they were warm. In the last crate, there was no mother. In each crate, a source of heat was provided (lights). Chicks were aged one day on the first day of the trial (noted D0). The third group (natural or N) was reared the same way compared to P and C, except for “mothers”. In the first crate, commercial laying hens were introduced. In the second crate, we introduced hens considered as good adopting mothers (“negre soie”). In each of the three buildings, mothers (fake or real) stayed in crates from D0 to D15. We considered that one mother for 10 chicks represented what may be seen in natural adoptive conditions. Hens were introduced at the same moment as the chicks. Each week, two events happened on two different days: a “visitor” and a “predator”. The “predator” consisted of a black flying object creating a shadow on the soil. The “visitor” consisted of an unknown person, wearing a white overall, a mask and a hat. Both events had been performed once a week to avoid habituation. Observations of animals were performed using one camera per crate. Both scan sampling and films were recorded. In each pen, one quarter of the area representing a Neutral Zone (or NZ) was not video taped. This neutral zone was also the area which contained the source of heat. Spatial localization of animals was observed twice: 5 minutes before and 5 minutes after the event. We focused on the reaction of the animals toward the event. On D8 and D38, 25 animals per crate were weighed individually. At the end of the batch, blood samples were drawn for HLR measurements. Animals were examined for overall health status on arrival at D0 and weekly. In groups P and C, treatment consists of a saturation of the atmosphere (passive diffusion) using either a putative pheromone (named HOA for Hens Odorant Analogue) or a placebo. Treatment was blinded. HOA consists of an analogue of the natural secretion of a laying hen having chicks. It has been included in a manufactured slow release block weighing 75g and containing 2% HOA. Crates were named as shown in Table 1.

Table 1. Crate names depending on the treatment

Crate	PVH	PV	P	CVH	CV	C	NA	NL	N
“mother”	visual+heat	visual	none	visual+heat	visual	none	adoptive	laying	none
Treatment	pheromone			control			natural		

## Results

Some data could not be adequately analyzed. First, the N building had to be removed from the study due to a significant number of injured chicks. Second, the data from the PVH crates could not be included in the study on D38 (except for video recordings). Scan samplings showed that chicks from C were close to the “mother” only if it was next to the feeder (one “mother” out of four). Before the third week, chicks spent most of the time in the NZ, except in CVH and PVH (more activity). From the period of approximately 21 days to the end, animals congregated in small groups (three to four individuals) resting or looking for a place to rest. More animals were showing feeding behaviour on the third week in the HOA building, regardless of which crate they were housed in (non statistical data). Animals’ reactions to events can be divided into two main categories: before and after the third week. Before this central point, animals were localised in the NZ, regardless of the event. From the third week to D38, chicks from HOA building were quicker to come to the feeder after the event (non statistical data). Within each building, no remarkable differences were observed during the visitor event. Animals went to the opposite crate side from the “visitor”. Chicks showed withdrawal reactions when the “predator” appeared (no building or crate effect). Chicks from all pens in the treated building had equivalent mean weights. We observed weight differences at D8 (CVH = CV < C, Student test,  $t = 2.31$ , 48 d.f.  $p < 0.05$ ). At D38, comparison between buildings showed higher live weights for animals under HOA (Wilcoxon test,  $z = 4.45$ , 148 d.f.  $p < 0.001$ ), whereas C was not different from P and CV weights were lower compare to PV weights (Wilcoxon test,  $z = 6.48$ , 48 d.f.,  $p < 0.001$ ). There was no difference in the HLR between buildings.

## Discussion

It is commonly accepted that “negre soie” are adoptive mothers but scientific data describing this fact are lacking. Thus, we conclude that young chickens (of this breed) cannot be adopted by adults (from another breed) in such an environment. The failure of adoption may be due to several causes: high density (four supplementary adults per pen compared to other buildings), confined areas or high number of chicks per hen. The fact that CVH and PVH chicks looked more active is probably related to a heat effect. Observed weight differences at D8 are in accordance with the fact that chicks without HOA seem to be afraid of the toys. Results concerning animals’ spatial localization in C could mean that the desire to eat the food is greater than the fear of an unknown presence. The comparison of the buildings highlights the fact that characteristics of the crates (treatment and toys) are of importance. To improve our model, it would be interesting to work on several points. (1) Physiology: segregate the crates with regard to HLR and studying corticosterone levels (Post et al. 2003). (2) Behaviour: avoid a NZ and consider both vocalizations, im-

portance of predator's eyes, and animals' Tonic Immobility (Gallup 1977, Campo et al. 2000). (3) Studying correlation between parameters.

## **Conclusion**

It appears from our results that HOA could represent a useful tool to study links between easily observed and tabulated parameters and behaviour. The final objective of this work is to establish a correlation among all studied factors to have a straightforward behavioural approach by studying physiological and growth parameters.

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## **Keywords**

*chick, hen odorant analogue, husbandry, measurement*

# **Influence of Appropriate Water Supply for Peking Ducks (*Anas platyrhynchos*) on Behavior during Common Fattening Period**

***E. Heyn\**, *M. Manz*, *F. Remy*, *K. Dammei*<sup>1</sup>, *M. Erhard***

## ***Introduction***

As well as the wild ancestors the domestic Peking duck (*Anas platyrhynchos*) kept for fattening purposes still shows clear preferences for open water and makes use of water for foraging and feeding, drinking, for general exploration, locomotion and preening, even without prior experience. Because of labour, hygiene, technical and economical reasons ducks are nowadays mostly kept in closed buildings without access to open water. This significantly restricts their freedom to show their natural behavior. An obvious consequence of this restriction is a deteriorated plumage condition, especially with regard to cleanliness (Knierim et al. 2004). At present there is no clear ruling in the European Union or in Germany regarding husbandry conditions for aquatic birds. Ethologists and animal rights groups criticize that the fattening of aquatic birds disregards the well-being and appropriate behaviour of those animals.

Aim of this study was to look over behavior, hygiene, immuno- and stress parameters in the housing of Peking ducks and also to invent a new drinking trough for appropriate water intake and feather maintenance.

## ***Materials and Methods***

During one fattening period (average 47 to 49 days) 1152 Cherry Valley Peking Ducks were available. The ducks were stalled on ground with straw litter in six

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*Institute of Animal Welfare, Ethology and Animal Hygiene, Veterinary Faculty, Ludwig-Maximilians-University, Munich, Germany*

<sup>1</sup>*Bavarian State Research Center for Agriculture, Kitzingen, Germany*

\*Corresponding author: e.heyn@tierhyg.vetmed.uni-muenchen.de

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compartments (32 qm), each 192 animals. 25 percent (8 qm) of the compartment areas were perforated grid, where the different modified drinking troughs were installed (area video observed). Experimental group I could choose between the round drinker for turkeys (modified by Heyn and Erhard) and a Lubing nipple drinker TM. In addition to the nipple drinkers experimental group II had a hollow drinker. The control group was only provided with nipple drinkers. At the 21st and 47th day of life each compartment was directly observed for 40 minutes (Scan sampling, time slice 2 min) and video observed for 24 hours (Instantaneous sampling, time slice 5 min).

At the same days 20 ducks of each compartment were evaluated (feather coat, feather soiling) and blood samples were collected.

### ***Results and Discussion***

At the end of the fattening period 65 percent of the nipple drinkers had at least one nostril blocked up compared to 25 percent of the hollow drinkers and 5 percent of the round drinkers. Ducks that had only access to nipple drinkers showed significantly more plugged up nostrils than animals from compartments with open water drinkers. During direct observation 0.4 percent of the ducks with nipple drinkers drank water, where as 2.2 percent of the animals in compartments with hollow drinkers and 1.3 percent of the animals in compartments with round drinkers drank. In compartments with exclusively nipple drinkers more ducks rested (92.0%) than in compartments with open water drinkers (82.0%). During the 24-hour video observation it appeared that ducks showed an explicit higher activity at the open water drinkers than next to the nipple drinkers. Thus 47.5 percent of the ducks rested in the area next to the nipple drinkers in comparison to areas next to open water drinkers with 11.5 percent ( $p>0.05$ ). In the direct surrounding of the open water drinkers 44.0 percent of the ducks drank water (24.5% at the nipple drinkers,  $p<0.05$ ), 12.5 percent cleaned themselves with drinking water compared to 0.0 percent in compartments with nipple drinkers only ( $p<0.05$ ). The percentage of ducks showing cleaning, walking or standing in the areas of the drinkers was equal in compartments with open water drinkers and compartments with only nipple drinkers.

Looking at the water consumption we could find, that the ducks in compartments with only nipple drinkers drank almost the equal amount of water at the nipple drinkers located on the right and on the left side in each compartment (right side: 49.6%, left side: 50.4%). Where as in compartments, where the ducks could choose between nipple and open water drinkers up to 80 percent of the water used during fattening period was taken up at the open water drinkers (see table 1).

Table 1. Water supply in three compartments with choice of waterer

	Nipple drinker		Nipple and Round drinker		Nipple and Hollow drinker	
	Nipple right	Nipple left	Nipple	Round drinker	Nipple	Hollow drinker
Water supply						
liter/compartment	2202	2248	1400	5725	1586	5606
liter/duck	11.5	11.7	7.3	29.8	8.2	29.2
percent (%)	49.6	50.4	19.7	80.3	21.9	78.1

### **Conclusion**

In conclusion, it could be found that the availability of open water drinkers (round drinkers as well as hollow drinkers) leads consistently to a higher activity and species-specific behaviour pattern on the open water drinkers compared to the nipple drinkers. The access to open water drinkers- even only at certain times of the day- promises to be an amelioration of the ethological requirements, the welfare and the health in the husbandry of ducks. Although it is necessary to take water hygiene and economical reasons into consideration before final conclusions can be drawn.

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### **Acknowledgement**

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### **Keywords**

*behavior, drinking bowl, Peking duck*

# Development of Grazing Posture Preference in Foals (0–1 Yr) and Their Dams and Its Relation to Other Asymmetrical Behaviours

**M. C. VanDierendonck\*, M. C. V. van Heel,  
A. M. Kroekenstoel, W. Back**

## **Introduction**

In several equine sports disciplines, horses (*Equus ferus ferus* also called *Equus caballus* or *Equus przewalskii f. caballus*) are expected to perform symmetrically on both hands. However, many riders report a preference for one or either side of their horse, which is also documented in the literature (Grzimek 1949, Meij and Meij 1980). Consequent asymmetry in certain behaviours can lead to physical asymmetry and possibly increase susceptibility to lameness. It has been postulated that those horses which have a preferred side, can acquire this during the ontogeny of grazing behaviour at foal age.

In this study, the hypothesis was tested whether foals develop a “handedness” (a preference to consequently have the same limb re- or protracted) while grazing during the first year of their life. It was hypothesized that a “handedness” while grazing was reflected on the same side in other asymmetrical behaviours such as cantering, suckling, sternal—and lateral resting. Furthermore, it was hypothesized that a preference of the dam determined the preferred side to suckle in the foal. Last but not least, a decrease in strength of the preference was expected during an indoor housing period, due to differences in forage possibilities as well as differences in presentation, location and height of the fodder compared to grass.

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*Dept. of Animal, Science and Society and Equine Sciences, Faculty of  
Veterinary Medicine, Utrecht University, P.O. Box 80166, NL-3508 TD  
Utrecht, The Netherlands*

\*Corresponding author: m.c.vandierendonck@vet.uu.nl

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## **Materials and Methods**

From birth to just over one year old, 24 Warmblood foals were followed in their behavioural development. Weekly behavioural 10 minute scan sampling observations of 48 times/day were carried out from birth until at least 31 weeks of individual age. Between 52 and 59 weeks of individual age they were also observed weekly during 3 consecutive weeks for 48 times/day. At each observation the behaviour of the foal was scored, in case of an asymmetrical behaviour the side was recorded; in case of grazing or foraging, the distance between both front feet was estimated. The foals were observed until a minimum age of 31 weeks (their weaning age). The observations took place in the field and after the beginning of October indoors in a group housing system. The foals were observed again in the second field period during the next summer in August around 55 weeks of age.

Since weekly behaviour observations are impractical and a simple test for future use is desirable, a special “handedness” preference test was developed. This test triggers the foal to reach as low as possible to the ground or to a table. Among many other things the protracted limb was determined. The table served as the minimum norm (per animal) to determine whether the feet were spread or rather within the normal distance. The “handedness” test was validated by performing it at 12, 15, 27 and 55 weeks of age and comparing it with the equivalent field observations in respectively the first and second period. The dams were also tested with the “handedness” test. The z-value was used to compare the observations.

## **Discussion**

It appeared that foals were born without a preference and did not show any significant “handedness” shortly after birth. As a precocial species, the foals were born with relative long legs compared to their body conformation. Around 3–4 weeks of age, foals started to nibble and consume grass. At this age they could not reach the ground with their noses and had to find a posture in which they could reach the ground. After a while, most foals adapted to a stance with one retracted and one protracted limb. Subsequently, indeed roughly 50% of the foals developed a “handedness” for either the left or the right limb. The foals, which developed a significant preference, did so within the first 8–12 weeks of age and kept this preference during the remainder of the study. The results of the grazing and indoor housing foraging observations were highly correlated both with each other, as well as with the “handedness” test results for each of the test ages. There was only a weak relation between the other asymmetrical behaviours and the “handedness” during grazing. The preference reduced in strength during the indoor housing period, however, in the second summer the same preferences as during the first summer reappeared. Foals with a preference had a significant larger distance between their front feet, compared to foals without a preference. A similar percentage (52%) of the mares as with the foals showed a “handedness”. However, there was neither a relation between the

“handedness” of the foal and its dam nor between the preference of the dam and the suckling side of the foal.

### **Conclusion**

This study showed that indeed “handedness” in foals is acquired post partum, it persists even after indoor housing and can also be recognized in adult horses cf. their dams. Handedness is in this study strongly related to grazing posture, but not to other asymmetrical behaviours.

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### **Keywords**

*development, foal, grazing, handedness, horse, laterality, posture*

# The Effect of Handling and Environmental Enrichment on the Exploratory and Alert Behaviours and Reactivity Level of Foals (*Equus caballus*)

**M. Panzera\*, E. Trobia, M. D'Anna, G. Innella**

## **Introduction**

The evaluation of emotional reactivity in domestic animals has recently emerged as a topic of interest in veterinary ethological research. Inadequate environmental conditions may compromise the complete development of normal behaviour. Management techniques could influence the emotional reactivity, which includes the fear reaction. The welfare of an individual animal depends on the ability to cope with environmental challenges (Broom, 1988).

The term “coping” response in animals describes the behaviour shown in difficult (*challenging*) situations with which animals are confronted in a natural environment (Wechsler, 1995). Individual behavioural and physiological responses toward challenging events can show considerable variability (Manteca and Deag, 1993). Monotonous environments and social deprivation have been implicated in the development of adverse behaviours and inappropriate reactions toward new stimuli. The provision of environmental enrichment can increase the expression of exploratory behaviours and reduce fear of novel objects (Pearce and Paterson, 1993). The success of any type of environmental enrichment relies upon its ability to reinforce a motivated behaviour, e.g. exploratory or feeding motivation.

Barren environments can affect behavioural development so that the animal's ability to cope with the environmental challenges are less pronounced. Alteration of the social experience of the newborn foals (*Equus caballus*) can affect normal social attachment and subsequent behaviour. The nature of the interaction between the environmental enrichment and handling is largely unknown, but the influence of these two parameters could have important ramifications for animal welfare.

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*Laboratory of Veterinary Ethology; Dept. of Morphology, Biochemistry, Physiology and Animal Production, University of Messina, Italy*

\*Corresponding author: mpanzera@unime.it

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Pre-weaning handling techniques can influence the horse's behavioural development by reducing avoidance and fear reactions towards humans and producing a more balanced emotional level (Panzera and Trobia, 2002). Fear functions to protect the animal from injury. Fearfulness is the constitutional trait that determines the propensity of an individual to be more or less frightened and to show fear responses in a potential alarming situation. Performance is likely to be reduced if the horse is fearful and it can be dangerous to try to handle fearful animals. The handling technique is a process by which the foal learns to recognise humans, not as a mother, but as a member of its group. This phenomenon occurs rapidly during the sensitive period, soon after birth. Horses deprived of social companionship are at risk for developing aberrant behaviours. The interaction between horse and people is altered by the social system in which they live and by previous experience of that system. Horses kept in stalls are deprived of opportunities for social interaction and their performance of natural behaviours is limited (Hogan et al. 1988). Periodic direct contact by human handlers was found to help reduce fear responses in horses when approached subsequently by humans (McCann et al. 1988.). The purpose of this experiment was to determine the interactive effects of handling and environmental enrichment on the behaviour, reactivity during novel situations and fear of humans.

### ***Materials and Methods***

In this study we compared the avoidance and fear reactions of two groups of foals. Foals in the first group were handled from birth until the second month (Group A consisted of three mare-foal pairs). Foals in the B group (Group B consisted of three mare-foal pairs) were not approached by humans until the sixth month, except for necessary veterinary treatment.

The management techniques include a partially enriched stable for Group A with a single box for each mare-foal pair (4 × 4 m.), with gridded divisions next to the box of other foals and mares and an external private paddock (6 × 28 m.) allowing the horses to see, hear, smell but not physically interact with neighbouring horses. Group B was kept in a group in a total enriched stable including a unique single box with a large paddock (30 × 20 m.) permitting physical interactions among horses and the development of social and investigative behaviours. Handling for the Group A foals involved rubbing the entire body, ears, nostrils, touching, grooming, and lifting feet. All foals were tested at three months with an "isolation from mare" test and a novel object test. We recorded all behaviours that appeared during the session test using a digital videotape recorder and recorded the Heart Rate (HR) related to each behaviour by measuring with a telemetric heart rate monitor (Polar Horse Trainer®, Polar Electro Europe BV, Switzerland). We also recorded the number of times the foal looked at or snorted at the stimulus, the latencies to touch the new object and the latencies to defecate. The latency to touch the new object was used as a measurement of fear. A well recognised indication of stress and

nervousness in some species is the number of excretory acts (Archer, 1973). We choose the Kruskal-Wallis non-parametric statistic test to examine our data.

## **Results and Discussion**

Group A foals had a significantly longer latency ( $P<0.05$ ) to touch the new object. Their behaviour suggested that they were also more suspicious of the novel stimulus. Van Reenen *et al.* (2004) suggests that the latency to approach a novel object can be used as a fear measurement in different species, with long latencies indicating high levels of fear. Therefore it seems likely that the early enrichment provided here, might account for apparent differences in fear reaction to a novel object between the two groups.

The latencies to defecate from the mare exit time also differed. Group A showed a longer latency to defecate ( $P<0.05$ ). The observation that the handled horses reacted less to the isolation from mare could indicate that handling by humans is a means of reducing stress responses of an individual to its separation from group mates.

## **Conclusion**

Emotional reactivity is an important intervening variable in social behaviour, reproductive behaviour, the performance of athletic horses, human-horse relationships and also the horse's ability to adapt to environmental challenges. Intensive housing systems offer the animal a barren environment that does not elicit variable and differentiated behaviour, and does not allow the animal to live in a stable group. This housing condition also does not allow the animals to cope with aversive situations. Each human-horse interaction should cause benefit and not harm to the horse's training and tractability. Our results suggests that the best management techniques include consideration of the effects of pre weaning handling techniques and interaction that have the potential to reduce fear reactions in social situations (isolation test) and environmental enrichment which might reduce fear reactions toward new stimuli.

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**Keywords**

*handling, horse, management, reactivity*

# A Search for Temperament-Associated Genetic Polymorphisms in Horses

**Y. Momozawa, R. Kusunose<sup>1</sup>, T. Kikusui, Y. Takeuchi\*,  
Y. Mori**

## **Introduction**

“Different horses (*Equus caballus*) have different temperaments,” which is important not only in stables, because horses are animals of which potential for riding or racing depends largely upon how well we can communicate with them. As it has been empirically suggested that equine temperament is inheritable, the genetic mechanism underlying equine temperament has been interesting to researchers, veterinarians, breeders, riders, and so forth, although it is yet largely unrevealed (Haupt and Kusunose 2000). Recent development of molecular biology has enabled U.S. to approach this issue. In this study, we investigated genetic background of equine temperament by conducting three studies as follows.

For assessing equine temperament a questionnaire survey to the professional caretakers was adopted instead of behavior tests. A questionnaire survey is often considered to be less objective, but it could be more suitable for this kind of research because it can assess various temperamental traits at the same time. We previously reported that the results of a questionnaire survey agreed with those of behavioral tests (Momozawa et al. 2003). In this study, we conducted modified questionnaire surveys with two separate groups of Thoroughbred horses to assess the reliability of the questionnaire.

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*Laboratory of Veterinary Ethology, The University of Tokyo, Tokyo,  
113-8657, Japan*

<sup>1</sup>*Equine Research Institute, Japan Racing Association, Tochigi, 320-  
0856, Japan*

\*Corresponding author: [aytake@mail.ecc.u-tokyo.ac.jp](mailto:aytake@mail.ecc.u-tokyo.ac.jp)

As the candidate genes influencing the equine temperament, we focused on neurotransmitter-related genes, because many previous studies in human psychiatry and pharmacological fields have suggested that a subtle change in dynamics of neurotransmitters such as serotonin and dopamine may alter behavior patterns. In order to find out polymorphisms in the genes responsible for genetic individuality in equine temperament, we have determined the sequence and searched for polymorphisms mainly in the coding regions of 10 genes to date.

We adopted 136 two-year-old Thoroughbred horses from the same farm for investigation of the association between genetic polymorphisms and temperament which was assessed by the questionnaire survey in an attempt to minimize the influence by various factors on equine temperament such as breed, age, and social environment.

## ***Materials and Methods***

### **Assessment of temperament**

We conducted a questionnaire survey, which was followed by factor analyses for assessment of equine temperament. This questionnaire had a 9-point response scale to 20 questions. Respondents to this survey consisted of three professional caretakers for each horse; all of the caretakers were familiar with the particular horse for which they provided answers. As one of the methods to verify the reliability of this method, we examined if the factor structure of the assessment was conserved between the two surveys. Factor analysis was performed for respective surveys using the principle factor method for factor extraction and Varimax rotation for orthogonal transformation. The factors extracted from both surveys were compared to find what factors were conserved. In addition, we calculated Cronbach's  $\alpha$  reliability coefficients on common items that belonged to each conserved factor to assess the internal consistency for the conserved factors.

### **Genetic analysis**

We have adopted 10 genes that are related to neurotransmitters as candidate genes influencing equine temperament, namely, genes coding the monoamine oxidase A and B (MAOA, MAOB), catechol-O-methyltransferase (COMT), tyrosine hydroxylase (TH), dopamine beta hydroxylase (DBH), serotonin transporter (5HTT), serotonin 1A, 1B, and 2A receptors (5HT1A, 5HT1B, 5HT2A), and dopamine D4 receptor (DRD4). As most of the DNA sequences of these genes had not been revealed, we carried out subsequent genetic analysis as follows. We first determined partial sequences by using the cDNA derived from the brain tissue of a Thoroughbred horse and consensus primers based on corresponding sequences reported in other mammals. The 5' and 3' regions of the cDNA were sequenced using the rapid amplification of cDNA ends (RACE) method. In order to identify the polymorphisms that locate mainly in the coding region, we compared the sequences of



cDNAs derived from the brain tissues of 10 genetically unrelated Thoroughbred horses. Genetic polymorphisms, which were considered to cause an amino acid substitution, were subjected to subsequent association studies.

### **Association study**

To examine the relationship between the temperament and polymorphisms causing the amino acid substitution, we carried out the questionnaire survey for assessing equine temperament and the genotyping of polymorphisms with 136 Thoroughbred horses. After the homogeneity of distribution was confirmed by F-test, we used the Student's t-test to investigate the influence of the polymorphisms on each of the 20 items. In order to avoid the Type I error derived from multiple statistics, we adopted the Bonferroni correction and set the level of significance at  $p = 0.05/20 = 0.0025$ .

## **Results**

### **Assessment of temperament**

In both surveys, five factors were extracted by factor analysis. By comparison of the factor structure of both surveys, four traits of equine temperament, namely 'Anxiety', 'Trainability', 'Affability', and 'Gate entrance', were extracted in both surveys, which suggested the consistency of the factor structure. In the subsequent analysis, we obtained high Cronbach's  $\alpha$  reliability coefficients which indicated sufficient internal consistency. These results suggest that by using this kind of survey, equine temperament could be precisely assessed (Momozawa et al. 2005<sup>a</sup>).

### **Genetic analysis**

Among 10 neurotransmitter-related genes, we determined complete sequences of translated regions of six genes and partial sequences of the remaining four genes. By searching for polymorphisms in the coding region, each of the following four genes were found to possess one missense single nucleotide polymorphism (SNP) causing the amino acid substitution; COMT (Momozawa et al. 2005c), DRD4, 5HTT, and DBH. On the other hand, no polymorphism was found in the MAOA or MAOB gene. However, these analyses are still on going.

### **Association study**

We carried out the association study between equine temperament and genetic polymorphisms in the DRD4 and 5HTT genes. The COMT and DBH genes were excluded due to the low frequency of their polymorphisms. By analyzing the association between the SNP (the A-G substitution) in the DRD4 gene and temperament scores, a significant association was revealed between the A-G substitution and two temperament traits ('Curiosity' and 'Vigilance'), i.e. horses without the A allele had significantly higher 'Curiosity' and lower 'Vigilance' scores than those with the A allele (Momozawa et al. 2005<sup>b</sup>). On the other hand, between the consecutive SNPs

(AC1615, 1616GT) in the 5HTT gene and temperament traits no association was found to reach the level of significance after the Bonferroni correction.

## **Discussion**

In this study, we carried out the assessment of equine temperament and genotyping of polymorphisms using 136 Thoroughbred horses to investigate the association between them. We have carried out the association study with four genes so far, and we found significant associations between the SNP (the A-G substitution) in the DRD4 gene and the 'Curiosity' and 'Vigilance.'

Based on the results of the first part of this study it was suggested that equine temperament can be assessed precisely by using the questionnaire survey to the professional caretakers as the factor structure was well conserved between the two independent horse groups. The questionnaire survey has often been claimed to be less objective than behavior tests, but it appears useful for assessing various temperament traits at one time. We therefore propose that a following kind of strategy would be practical to investigate the association between polymorphisms of candidate genes and equine temperament. First, by taking the advantage of the questionnaire survey, an association study between genetic polymorphisms and temperament assessment by the questionnaire survey is conducted. If some associations are found, then some behavior tests are to be planned to confirm the hypothesized association. This two-step strategy would enable us to approach the complicated mechanism of equine temperament.

Our association study suggested that the SNP in the DRD4 gene might be related to individual differences in 'Curiosity' and 'Vigilance' in Thoroughbred horses. In humans, the seven repeat allele of VNTR was reported to associate positively with an elevated score for novelty-seeking (Benjamin et al. 1996; Ebstein et al. 1996). DRD4-knock-out mice exhibit reductions in behavioral responses to novelty, reflecting a decrease in novelty-related exploration (Dulawa et al. 1999). These results were in accordance with ours. In addition, the results from a more recent study indicated that some genetic factors, such as sire and breed, influence neophobic reactions in horses (Hausberger et al. 2004). As the neophobic reaction is considered in line with the 'Curiosity' and 'Vigilance' traits, the SNP in the DRD4 gene that were found in this study might be a proportion of genetic factors responsible for equine neophobic reaction.

We could not find any significant association between SNPs revealed in the 5HTT gene and temperament traits. However, polymorphisms in the promoter region of the human 5HTT gene governing the expression of this transporter have been reported to affect the anxiety trait. As this trait is considered to be an important trait for horses as well, we are now searching for the polymorphisms in this gene particularly at the promoter region. Although we could not conduct an association study with the COMT or DBH gene due to very low frequencies of their minor al-

les, more research is needed to investigate how these minor alleles influence the function of translated proteins as it was reported that even the rare polymorphisms could be associated with some psychiatric disorders (Ozaki et al. 2003).

In our future study, we plan to incorporate as much candidate genes as possible to find more association with equine temperament. At the same time, genome cyclopedic analyses are also needed to search for genes governing equine temperament. In humans and mice, of which sufficient genetic information have become available, linkage analysis with genetic markers can be easily performed. On the other hand, in horses, there are not yet enough markers registered to carry out linkage analysis. One of the alternative methods is an amplified fragment of length polymorphism (AFLP) method, which does not require genetic information. With this method, in addition to the candidate gene studies, we are currently investigating the genetic mechanism of equine temperament in the hope that we may be able to predict the temperament of individual horses more precisely and objectively at earlier stage of their life, and to propose a tailor-made training program for each horse based on individual genetic background.

## **Conclusion**

We carried out assessment of equine temperament by questionnaire survey and genotyping of polymorphisms in the neurotransmitter-related genes. The significant association was found between the SNP in the DRD4 gene and ‘Curiosity’ and ‘Vigilance.’

## **Acknowledgement**

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**Keywords**

*behavior, horse, measurement, polymorphism, questionnaire, temperament*

# **Aggression in Wolves (*Canis lupus*): Ambivalent Behaviour as a Model for Comparable Behaviour in Dogs (*Canis familiaris*)**

***J. F. Fatjó<sup>1\*</sup>, M. Mets<sup>1</sup>, B. Braus<sup>2</sup>, M. Amat<sup>1</sup>, J. L. Ruiz de la Torre<sup>1</sup>,  
D. Feddersen-Petersen<sup>2</sup>, X. Manteca<sup>1</sup>***

## ***Introduction***

Canine aggression problems impair the welfare of dogs and can be very dangerous for people (Guy, et al. 2001; Hunthausen, 1997). Aggression towards family members is the most common form of aggression seen by veterinary behaviourists (Askew, 1996; Beaver, 1999).

For many years, most cases of aggression towards family members have been considered to be linked to an underlying hierarchical conflict between the dog and one or more members of the human family (Beaver, 1999; Borchelt and Voith, 1996; O'Farrell, 1992). Another common reason for a dog exhibiting aggressive towards family members is commonly related to fear reactions. An example of this would be in situations that cause pain, like severe physical punishment (Askew, 1996; Houpt, 1998).

The diagnosis of so-called dominance aggression is primarily based on the situation in which aggression occurs, whereas the identification of fear-related aggression is more commonly linked to the observation of a defensive body posture (Askew, 1996; Borchelt and Voith, 1996; Houpt, 1998; O'Farrell, 1992). However, categories of aggression vary widely between different authors and there is a general

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<sup>1</sup>*Departament de Fisiologia, Facultat de Veterinària, Universitat Autònoma de Barcelona, 08193, Bellaterra, Spain*

<sup>2</sup>*Institut für Haustierkunde Christian Albrechts-Universität zu Kiel, Olshausenstr.40, D-24118 Kiel, Germany*

\*Corresponding author: jaume.fatjo@uab.es

lack of consensus regarding diagnostic criteria necessary to identify each of them (Overall, 1997; Reisner, 2002).

According to the hierarchical conflict model, a dominant aggressive dog behaves in a very assertive way each time the owner challenges the dog's status or a competitive situation arises (Askew, 1996; O'Farrell, 1992). Besides the specific contexts, the hallmark for diagnosis of this form of aggression should be the observation of an offensive posture. Thus, the differentiation between a dominant or a fear related attitude is usually possible on the basis of body posture and facial expression. Interestingly, only some authors make clear references to the dog's body posture when discussing the diagnosis of dominance aggression (Haupt, 1998).

The aforementioned paradigm for dominance-aggression has been challenged during the past few years by an increasing number of authors. The main reason for that is that a significant proportion of dogs suspected to be dominant show ambivalent signals during aggressive episodes as well as demonstrate other more general signs of anxiety (Overall, 1997; Reisner, 2003).

Different explanations have been given to understand this phenomenon, from those who still think there is a competitive element to the behaviour, to those who relate these dogs' attitude to an active avoidance reaction (Mertens, 2002; Overall, 1997; Reisner, 2003). In any case, the formerly known dominance-related aggression seems to be a very complex entity, probably involving more than one motivation and frequently linked to a state of anxiety (Overall, 1997). Increasing the knowledge about these ambivalent signals could help to better understand aggression problems toward family members and consequently to develop more specific preventive and treatment protocols.

One of the problems encountered when studying aggressive reactions in pet dogs is that almost all data comes from the owner's own observations and these can be very subjective and biased. The study of visual communication in wolves can give insights into the natural patterns of agonistic behaviours, as external influences, such as training methods and owner's interactions, are minimal. Agonistic interactions have been studied extensively in wolves, but not always in great depth and detail. Visual communication in wolves seems to be more complex than expected and subtle changes of facial expression and body posture could be essential for the fine-tuning of social interactions (Harrington and Asa, 2002).

This study was designed to analyze visual communication patterns in wolves. The purpose of the study was to quantify ambivalent postures in wolves, to identify the contexts in which they occur and to identify the most common ambivalent signals.

## **Materials and Methods**

Agonistic interactions in a group of six European captive wolves (*Canis lupus lupus*), consisting of 3 males and 3 females, were analyzed for biting, body posture, and positions of ears, mouth, tongue, lips, legs and tail. The behavioral elements in

each of these categories were assumed to be 'neutral' or to signal an offensive or a defensive attitude. Wolves were considered to show ambivalence when offensive and submissive signs were observed simultaneously. The behaviour of the group was videotaped for a period of two months. As a result, more than 150 interactions were obtained, 100 of which were suitable for a frame-by-frame analysis.

## **Results**

The percentages and characteristics of agonistic interactions differed between individuals as well as between different pairs of wolves. Males took part in the vast majority of interactions and the omega male was involved in most of them.

The occurrence of ambivalence broadly depends on the definition taken for this particular category of behaviours. In one of its more restrictive meanings, our preliminary results found ambivalence in 16 percent of the time spent in agonistic interactions. The distribution of ambivalence was found to differ between individuals, but not between genders. The omega male and the beta female were the individuals more prone to shown ambivalent signals. The level of ambivalence displayed by the omega male was higher during interactions with the beta than with the alpha male. Looking at single body signals, such as baring teeth was not correlated with a higher rank order.

## **Discussion**

Results showed that ambivalent behaviour is a frequent part of the normal repertoire of visual communication in wolves. Most agonistic interactions were between animals of the same gender, probably reflecting a separate ranking order for males and females or at least showing different patterns of interaction based on gender and pack composition.

As other previous studies pointed out, our data clearly showed that aggressive signs, like bared teeth, are not restricted to high-ranking animals (Harrington and Asa, 2003; Reisner, 2002). More overt aggressive signals, like biting, were very uncommon and always of a ritualized and inhibited nature. Clear aggression signals were more frequent between low ranking individuals. Taken together, these observations suggest that some signals of aggression, like bared teeth or an inhibited bite on their own should not be used for diagnostic purposes as indicators of dominance status. If similarities between dog and wolf behaviour are assumed, these results could help to understand the meaning of ambivalent signals displayed by some dogs during aggressive interactions with their owners. The authors are aware that these data come from a single pack of wolves and consequently individual influences cannot be ruled out.

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## Keywords

*aggression, ambivalence, communication, competition, dog, wolf*



# Correlations Between Individual Specificities of Piglets (*Sus scrofa*) and Behavioural Patterns Involved in Cannibalism during Growing-Finishing Period

**D. Saffray<sup>1\*</sup>, F. Biagini<sup>2</sup>, I. Madec<sup>1</sup>, C. Lafont<sup>1</sup>, P. Pageat<sup>1</sup>**

## ***Introduction***

The incidence of cannibalism in pig production can be quite high and, in fact, several studies have found the incidence of cannibalism exceeding 10% of undocked pigs in intensive systems (Arey 1991). Cannibalism can have many consequences on health conditions, welfare and growing performances (Fritschen and Hogg 1983).

The way cannibalism occurs and develops, especially concerning the behavioural process that leads pigs to bite each other, is still unknown (Schröder-Petersen and Simonsen 2001). A preliminary study showed that several categories of individuals exist, with sometimes intensive biters and perpetual victims (Saffray and Gabarrou 2004). Yet all these individuals are raised in the same conditions and the different behavioural patterns observed for fattening pigs could be due to differences existing during maternity (Hessing et al. 1993, 1994). The aim of this study was to determine whether parameters regarding the sow (behavioural response towards human beings) or the piglet (birth weight, adoption, activity level, hierarchical rank) could be related to the categories the individual pigs fell into with respect to cannibalism.

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<sup>1</sup> Phérosynthèse, Le Rieu Neuf, 84490 Saint Saturnin Les Apt, France

<sup>2</sup> E.S.A.P., 75 voie du TOEC, 31076 Toulouse Cedex 3, France

\*Corresponding author: d.saffray@wanadoo.fr

## **Materials and Methods**

In a farm affected by cannibalism, 21 litters (221 piglets) were observed from birth to weaning (four weeks). At birth, piglets (*Sus scrofa*) were identified, weighed, and their adoptive status (i.e. adopted or not) was checked. In addition, we registered the behavioural response of the sows towards humans (confident, suspicious or apprehensive sows), using a test based on the one described by Hemsworth (1981).

Each litter was videotaped during 30 minutes each week. From video analysis, we established for each piglet the time spent in activity and the relative position to sow teats during suckling. Piglets were then observed during the post weaning and growing-finishing period. Pens where cannibalism occurred were videotaped twice for 30 minutes (morning and afternoon). Video recordings were analysed by means of a reading table, focused on the bite act. Individuals were classified into five categories:

1. Neutral individuals (N) were not involved in bites.
2. Rarely Implied individuals (RI) gave and received fewer than four bites and were involved in fewer than five bites.
3. Biters (B) showed a ratio Given Bites/Received Bites (GB/RB) equal to or over four.
4. Victims (V) showed a ratio GB/RB equal to or under 0.25.
5. Biters-Victims (BV) showed a ratio GB/RB between 0.25 and four.

## **Results**

Among the 221 studied pigs, 63 were present in pens where cannibalism occurred. In these pens, 10 pigs never bit and were never bitten (Neutral individuals) and 18 pigs were rarely involved in bites (RI individuals). Others were made up of 10 Biters, 11 Victims and 14 Biters-Victims (BV). The incidence of maternity parameters on these five behavioral groups describes which type of piglet may become biter, victim, or neutral individual (table 1).

## **Adoption**

Among the 17 adopted piglets in maternity, four have been involved in cannibalism during the growing-finishing period. One piglet had been identified as a neutral individual. Three others were Rarely Implied individuals. Biters, victims and biters-victims (35 individuals) have been raised by their mother during maternity.

Table 1. Incidence of maternity parameters on behavioural groups involved in cannibalism

Categories of individuals		N	RI	B	V	BV	Total
Number of piglets		10	18	10	11	14	63
Adopted piglets		1	3	0	0	0	4
Average birth weight		1.6	1.3	1.5	1.4	1.4	1.4
Suckling position	Anterior teats	3	10	4	2	5	24
	Posterior teats	5	5	3	7	6	26
	Variable	2	2	1	2	2	9
	Unspecified	0	1	2	0	1	4
# of piglets according to sow behavior	Confident	6	5	4	4	2	21
	Suspicious	1	2	1	2	0	6
	Apprehensive	3	11	5	5	12	36
Average activity time		1041 <sup>a</sup>	833 <sup>a,b</sup>	656 <sup>b</sup>	911 <sup>a,b</sup>	724 <sup>a,b</sup>	827

<sup>a,b</sup>: means with the same letter are not significantly different.

### Average birth weight

Birth weights were not significantly different among the five behavioral categories (Student Newman Keuls test,  $F = 1.77$ , 4 d.f.,  $p = 0.15$ ).

### Suckling position

The number of pigs suckling anterior, posterior or variable teats during maternity was not different from a category of individuals implied in cannibalism to another.

### Human sow behavioral response

Biters-victims have been more frequently raised by apprehensive sows compared to other categories of individuals involved in cannibalism ( $\text{Chi}^2$  test,  $\text{Chi}^2 = 6.00$ , 1 d.f.,  $p < 0.05$ ).

### Average activity time

Average time spent in activity during maternity is significantly different between biters and neutral individuals identified during cannibalism. (Student Newman Keuls test,  $F = 2.71$ , 4 d.f.,  $p < 0.05$ ). Biters were less active (36% of time) than neutral pigs (58% of time) during maternity.

## Discussion

Average birth weight and suckling position are parameters related to hierarchical rank during maternity. They don't seem to predispose piglets to develop a particular

behavior during cannibalism. Dominant piglets (the heaviest, suckling anterior teats) don't make up more future biters than other piglets. Dominated piglets (the lightest, suckling posterior teat or variable teats) don't make up more future victims.

Few adopted piglets ( $n = 4$ ) were present in pens where cannibalism occurred, thus we cannot make a conclusion about the relationship between adoption and behavioral pattern during cannibalism. Nevertheless the biters, victims and biter-victims we observed were non-adopted piglets, showing that being adopted is not compulsory to become a biter or a victim.

Sow behavior and activity level seem to be related to the categories of individuals observed during cannibalism. Future biter-victims are more frequently raised by apprehensive sows and future biters are less active than future neutral individuals during maternity. For this last parameter, it will be of importance to determine the reasons of this low activity level during maternity (physiological parameters, appeasing effect of sow-piglet interaction . . .) and also the consequences (socialization backwardness, distress after weaning . . .) of this low activity level.

## **Conclusion**

It seems that human-sow behavioral response and activity level of piglets during maternity can be related to the behavioral patterns pigs develop when cannibalism occurs during growing-finishing period. A part of the mechanism that leads to cannibalism takes place during maternity. Subsequent studies might permit to determine other parameters of the early life of pigs that predispose them to become biters, victims or neutral individuals. If this occurs, future biters or future victims could be picked out and then observed or kept apart during growing-finishing period, to prevent cannibalism.

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**Keywords**

*activity, biter, cannibalism, maternity, pig, victim*

# **Breed-Specific Profiles of Canine (*Canis familiaris*) Behavior**

***B. L. Hart\*, L. Hart***

## ***Introduction***

Veterinarians, as well as other animal care specialists, are frequently asked for advice about the most desirable breed of dog for a particular family or person. While morphological traits such as body size and length of hair coat are certainly important considerations, of prime importance with regard to the quality of the human-animal bond are behavioral characteristics of the dog. For example, some people may wish for a dog that would be particularly suitable for children while others may desire a dog for watchdog behavior.

To the degree that dogs of particular breeds have genetically related, behavioral predispositions, it is important for prospective dog owners and animal care professionals to have access to information about behavioral predispositions of various breeds that are free from personal biases of breeders or one's personal experience with a sample of just 1 or 2 members of a breed. Also, to the degree that there are differences in behavioral tendencies between male and female dogs, this information is relevant. It is especially important to offer such advice to clients prior to their obtaining a companion animal so as to maximize the duration and quality of the human-companion animal relationship.

A previously developed data-based system provided behavioral profiles for 56 of the most commonly registered breeds of the American Kennel Club (AKC) at the time the study was undertaken (Hart and Miller 1985; Hart and Hart 1985). Computer generated profiles utilized information gained from the rankings of randomly selected groups of 7 breeds from the master list of 56 on behavioral traits by 48

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*School of Veterinary Medicine, University of California, Davis 95616,  
USA*

\*Corresponding author: blhart@ucdavis.edu

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small animal veterinarians and 48 nationally registered dog obedience training judges. The study used telephone interviews with authorities judged to be familiar with differences between dog breeds by virtue of seeing many representatives of each breed and listening to dog owners boast or complain about their dogs' behavior. This procedure was deemed more reliable than asking authorities to assign an arbitrary score in which different authorities would be likely to have different frames of reference with regard to scoring. The data from ranking of dog breeds were used to derive an overall statistically based ranking of all 56 breeds on each of the characteristics (Hart and Hart 1988).

The approach was based on three premises: (1) significant differences exist in behavior among various breeds; (2) these behavioral differences are represented in the minds of authorities who have extensive experience with dog breeds and dog-owner relationships; and (3) behavioral information that exists in the minds of such authorities can be obtained by interviewing a large number of authorities with an interview format that minimizes the opportunity for them to talk about the breeds with which they have personal interest or experience. While the study design and methodology appeared sound and had advantages over other methods of describing behavioral differences (Hart 1995), only 56 breeds were analyzed and the breeds featured are not necessarily those that are currently popular. A new study was deemed appropriate to enlarge the number of breeds analyzed and to include currently popular breeds.

Of additional relevance, the genetic background and unique aspects of the behavior of the domestic dog have been the topic of publications in the general science literature. These studies have included the date and location of the ancient origins (Vila et al. 1997; Leonard et al. 2002; Savolainen et al. 2002), domestication of social cognition (Hare et al. 2002) and capacity to learn a couple hundred words (Kaminski et al. 2004). The last decade has also seen a good deal of research on the canine genome, laying the groundwork for investigation of behavioral differences between breeds that may be related to differences in breed-specific genomes. The most far-reaching study to date used molecular markers to study genetic relationships in a diverse collection of 414 purebred dogs, representing 85 breeds (Parker et al. 2004). Microsatellite DNA analyses revealed that breeds are genetically distinct and the authors were able to genetically assign 99 percent of the individual dogs to the correct breed. The computer analysis also showed that some breeds could be grouped according to genetic similarity. In one prominent group, traced back to wolf ancestry in Asia and Africa, the breeds included the Chow Chow, Shiba Inu, Siberian Husky, Alaskan Malamute, Shar-pei, and Akita. A second group, described as herding dogs, included the Collie, Shetland Sheepdog, St. Bernard, and Irish Wolfhound.

With the above background, the purpose of the present study was to obtain information allowing rankings of 80 of the most frequently registered breeds in the AKC on several behavioral characteristics. Because a new set of authorities was to

be interviewed, with a new assortment of randomly chosen breeds, the data from the present study are completely independent of those of the previous study. While the data for the present study were being collected (July 2003–June 2004), the above-mentioned comprehensive analysis of genetic differentiation of 85 dog breeds and their groupings based on genetic similarity (Parker et al. 2004) was pending publication. The genetic structure analysis of purebred dogs provided an opportunity to compare the grouping of some breeds on the basis of genetic similarity with clustering on some behavioral characteristics. Investigators of both studies were unaware of the ongoing study by the other investigators. Assuming a partial genetic basis for behavioral predispositions, the clustering of genetically related breeds on some traits, but not others, would point to traits that were common in the backgrounds of the breeds versus those that may have been selected more recently.

### ***Materials and Methods***

In order to achieve maximum uniformity among the individuals for ranking the breeds, small animal veterinarians were chosen as the only individuals to be interviewed. As mentioned, small animal veterinarians see the interactions between owners and their dogs, handle dogs in the hospital wards, and listen to the complaints and boastings about dogs from their clients. Telephone interviews rather than mail surveys were used based on the principle that telephone interviews would reduce the likelihood of response bias. Names of veterinarians, primarily in small animal practice and at least 5 years beyond graduation, were selected from the current directory of the American Veterinary Medical Association (AVMA) according to a systematic selection schedule utilizing the total range of names in three regions of the continental U.S.: Eastern, Middle, and Western. An attempt was made to interview men and women veterinarians approximately equally. Veterinarians were telephoned to confirm their location and were informed that they would be sent a letter by facsimile explaining the purpose of the interview, and an arrangement was made for an interview to be conducted at a later date by a registered veterinary technician or a veterinary student (both women). An identical interviewing protocol was followed by each of the interviewers after preliminary interviews were conducted for the purpose of standardizing the interview style. Of approximately 800 initial telephone contacts, a completed set of 168 interviews were conducted with 72 male and 96 female veterinarians.

Data on the most recently registered breeds from the 5-year span, 1998–2002, were obtained and the breeds ranked for each year as to frequency in registration. The mean over the 5 years comprised an adjusted list of the 84 most frequently registered breeds. The master list of 84 breeds was used to derive successive lists of 12 randomly selected groups of 7 breeds, for a total of 168 interviews. Each breed was potentially ranked against a group of 6 other breeds 14 times. Because it was expected that a few breeds from the master list would be relatively unfamiliar to many



of the authorities, plans were made to delete from the master list 4 breeds that most frequently could not be ranked.

Based on a review of the behavioral characteristics of the previous study, a decision was made to ask the authorities to rank breeds on just 10 behavioral characteristics: activity level, snapping at children, excessive barking, demand for affection, aggressiveness toward other dogs, aggressive dominance towards owners, territorial aggressiveness (defense), watchdog barking, trainability and ease of housetraining. The behavioral characteristics were expressed specifically in questions in which authorities were asked to rank a list of randomly selected breeds with regard to each of the characteristics. A means squares procedure was used to derive the final ranking of all 80 breeds for each characteristic.

When presenting each question for a behavioral characteristic the authority was first asked to compare neutered male dogs with spayed female dogs with regard to which sex was most likely to display the behavior without regard to breed. For the sake of uniformity the question was framed about only gonectomized animals because previous work has shown that castration of males may alter some behavioral patterns of interest such as aggressiveness (Neilson et al. 1997). An analysis was done on the scores given by authorities as to whether male or female dogs were more likely to display the characteristic under consideration, or whether there was no difference.

A separate analysis was conducted using the DNA microsatellite grouping provided in the published paper and the supporting online material of the genetic structure analysis of breeds of dogs (Parker et al. 2004). There was an overlap of 58 breeds between the genetic study and the present study. Breeds of two of the most closely-related groupings, the wolf-like and herding groups, with similarity coefficients of 0.99 and 0.61 respectively, were examined with regard to placement on each of the behavioral characteristic rankings. It was expected that the group of breeds with the highest similarity coefficient would show the highest tendency to cluster on at least some behavioral characteristics. Mixed model ANOVA's were used to compare differences in mean clustering on the characteristics.

## **Results**

Breed rankings, 1 through 80, were obtained for all characteristics. A representation of data for all 10 characteristics is beyond the scope of this paper. The breeds grouped by genetic similarity (Parker et al. 2004) were analyzed with regard to clustering on the various behavioral characteristics. On the traits reflecting aggressive tendencies, the wolf-like group clustered at the high end of the rankings and significantly differed from the herding group, which tended to cluster at the lower end of the same characteristics. The reverse was found with regard to demand for affection.

A significant difference between male and female dogs was found on all characteristics. The characteristics most strongly associated with males were aggressive

dominance, territorial aggression and aggression to other dogs. Characteristics for which female dogs ranked higher were trainability, ease of housetraining, and affection demand.

## **Discussion**

Confidence in the reliability of our system in developing behavioral profiles was underscored by a comparison with the genetic analysis in which breeds grouped together with relatively high similarity coefficients in genetic structure clustered on several behavioral characteristics. This is what one would expect if there were a genetic basis for behavioral traits. The group of breeds most closely related to ancestral wolves (referred to as the wolf-like group), and with the highest similarity coefficient, clustered at the low end of affection demand and at the high end of rankings on aggressive measures. The herding group of breeds, with the next highest similarity characteristic, clustered on the same characteristics, but at opposite ends of the wolf-like breeds.

The clustering of genetic groups, such as the wolf-like breeds and the herding breeds, on some characteristics but not others, suggests that, historically, the related breeds shared some behavioral characteristics, especially in the realm of aggressive behavior and affection display. However, selective breeding that was invested in individual breed development apparently resulted in breed-specific differentiation in other characteristics such as activity level and trainability. As mentioned, the breeds under consideration are virtually all genetically distinct, which implies that the breeds within a genetically related group would be expected to differ on a number of behavioral parameters as well as remain similar on others.

The individual veterinarians who contributed to the various rankings may have had biased viewpoints, but measures were taken to reduce the degree to which someone being interviewed would have undue influence on the database. This was done by using an unbiased procedure for selecting veterinarians to be interviewed from a directory and presenting them with a randomly selected group of 7 breeds to rank. No authority had any more influence than any other in the overall rankings. The data base was obtained from both men and women veterinarians and the 3 regions of the continental United States. Aside from some possible breed-related biases that may occur among veterinarians in general, there are some inaccuracies incumbent in the data collection system because of the necessarily limited amount of data that could be collected. While a greater sample size of rankings would presumably yield more accurate rankings, a larger number of interviews would probably not change the picture in a major way. In fact, the rankings and behavioral profiles of breeds that were represented in both the present study and the previous study (Hart and Hart 1988) were reasonably close.

The data extend the understanding of sexually dimorphic behaviors in neutered dogs. The occurrence of sexual dimorphism in mounting and urine marking is

quite obvious and has been documented in laboratory studies (Hart and Eckstein 1997). In the present study the behavioral differences between sexes (neutered) on all 10 characteristics were derived from the opinions of authorities rather than laboratory observations, but assuming the cumulative rankings of so many authorities reflect real behavioral differences between the sexes, the analysis reveals a continuum in the magnitude of sexually dimorphic traits.

The results of this study will allow veterinarians to advise clients who are prospective dog owners about the appropriate breeds and sex of a dog for the lifestyle and personality of the client. Selection of a companion dog might be best approached by first using behavioral criteria to comprise a short list of potential breeds. Final selection would then be based on learning more about a particular pedigree line within a breed, the behavior of the dam, sire and siblings from previous litters, and whether a male or female is most appropriate as well as the environment in which the young dog will be raised. There are clearly behavioral differences among dogs within given breeds representing both genetic variability as well as environmental and experiential effects. All of these factors should be taken into account in advising clients on selecting the most appropriate breed and gender for an enduring canine companion relationship.

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### **Keywords**

*behavior, breed, dog, genetics*

# Measuring Personality Adjectives to Measure Personality in Dogs (*Canis familiaris*): Report on a Pilot Study

*J. M. Ley\*, P. Bennett*

## **Introduction**

When the dog-human bond is strong, dogs contribute much to the well-being of their owners. While the costs of a fractured bond are obvious in animal shelters, very little is understood about how the bond between humans and dogs functions. Certainly the behaviour of the dog plays a large role in the success or failure of a bond. Understanding and being able to predict behaviour in individual dogs would aid in the effective selection of dogs for different roles within our communities.

Behaviour is affected by internal factors such as affect, motivation, needs and previous learning (Ahadi and Diener, 1989) as well as factors external to the individual. In humans, personality represents the multitude of internal factors that affect how a person behaves. While there are several theories of human personality, trait theory predominates. The most widely accepted trait model for human personality is the five factor model (FFM).

Dogs and other animal species have been found to have behavioural individual differences (BIDs) which show remarkable similarity to personality in people. An overview of animal studies found that while nomenclature varied, there did appear to be an underlying structure to animal personality and it had many parallels with the FFM for people (Gosling and John, 1999). While personality factors can be reliably identified in animals there has been a tendency for researchers to rely on human personality descriptors (Gosling et al. 2003). Few attempts have been made to ascertain if dog personalities fall into the same dimensions as do human personalities.

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*Psychology, Monash University, Clayton VIC 31, Australia*

\*Corresponding author: [Jacqueline.Ley@med.monash.edu.au](mailto:Jacqueline.Ley@med.monash.edu.au)

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Thus the questions that are considered are: Is the FFM a suitable model for categorizing personality in dogs? Can personality be measured in dogs using an owner-administered, personality adjective based questionnaire?

## **Method**

### **Participants**

Two focus groups consisting of professional and volunteer pet dog trainers, pet dog owners, dog breeders, show exhibitors and dog sport enthusiasts, were conducted to generate a list of adjectives considered relevant to people with experience with dogs.

Participants who completed the questionnaire were adults at least eighteen years of age who owned a dog or dogs aged at least 18 months. Participants were sourced from dog training establishments, public dog parks and through friends and acquaintances of the authors. Participants owning multiple dogs were able to fill in separate questionnaires for all their eligible dogs, but were instructed to consider only one dog while completing each questionnaire.

### **Words**

A list of 203 personality adjectives was generated by considering words from previous research into the FFM in people (Goldberg, 1990; Saucier, 1994) and dogs (Gosling et al. 2003), breed standards (Australian National Kennel Council, 2004) and dog books written for the lay public (Marples, 1983). This methodology has been used successfully to develop models of personality factors for other species of animals (Gosling, 1998; King and Figueredo, 1997). The list of words was randomly ordered in the questionnaire. Participants were asked to rate, on a six point scale, how well each word described their dog with 1 being doesn't describe my dog, and 6 being really describes my dog on the questionnaire.

### **Analysis**

The data were analysed using an exploratory Principal Component Analysis (PCA) using SPSS (v11.0.5.). Items are screened for inclusion in the PCA using their means and variances to ensure there is adequate variability for successful analysis. Assessment of the scree plot and variance for each factor determined which of the suggested solutions explained the data most appropriately.

The traits included in each factor were tested for relatedness using Cronbach's alpha.

### **Results**

Ninety two questionnaires were available for analysis. Of the respondents, 78.3 percent were female, and the age range was from 18 to 77, with the mean age being 42.1 +/- 14.6 years.

The dogs' ages ranged from 18 months to 15.8 years, with over half the dogs being aged less than 7.0 years. Thirty dog breeds, from all seven breed groups recognized in Australia, were present in the pilot group, along with one unregistered breed (Australian Bull Dog) and three categories of cross bred dogs (small, medium and large). Most of the dogs were desexed (79.8%) and there were slightly more females (58.5%) than males (41.5%).

Principal Component Analysis revealed four personality factors. These appear to reflect dimensions which could be labelled Agreeableness, Extroversion, Conscientiousness and Social Confidence (see table 1).

Cronbach's alpha for each of the factors were above 0.75, the lowest being 0.7738 for Conscientiousness and the highest being Extroversion at .9010.

Table 1. Canine Four Factor Model of Personality Factor Items and Cronbach's Alpha

Extroversion	Agreeableness	Conscientiousness	Social Confidence
Energetic	Easygoing	Attentive	Brave
Lively	Friendly	Consistent	Assertive
Active	Nonaggressive	Predictable	Determined
Enthusiastic	Happy-go-lucky	Persevering	Protective
Exuberant	Sociable	Careful	Nosey
Excitable	Merry	Vigilant	Cheeky
Spirited	Adaptable	Biddable	Tenacious
	Carefree	Sensitive	Proud
	Relaxed		Watchful
	Amiable		Versatile
	Patient		
	Hardy		
$\alpha = 0.9010$	$\alpha = 0.8659$	$\alpha = 0.7738$	$\alpha = 0.7849$

## Discussion

The aim of this study was to assess the FFM for suitability as a model for canine personality using pet dog owners and a personality adjective rating methodology. Four personality adjectives were identified, three showing similarities with the FFM factors of Extroversion, Agreeableness, Conscientiousness. The fourth factor was labelled Social Confidence. The two FFM factors of Emotional Stability and Openness to Experience, which were expected to appear on the basis of previous research, were not identified in this study.

The Agreeableness factor identified in this study shows similarity with the

agreeableness factor of the FFM. The canine factor also contains traits associated with extraversion and emotional stability, suggesting canine agreeableness differs from human agreeableness.

The canine extraversion factor is most like its human counterpart. Factors similar to the extroversion factor identified in this study have been identified in several other studies (Svartberg and Forkman, 2002; Wilsson and Sundgren, 1997).

The third factor contained traits traditionally associated with a narrow area of Conscientiousness in the FFM. Previously only humans and chimpanzees were considered to have conscientiousness traits (Gosling, 1999). Certainly this area requires investigation.

The last factor, Social Confidence, is unique to this study and appears to reflect traits which are important to dogs living with people. This traits contained within Social Confidence are traditionally associated with other FFM factors and may reflect the degree to which dogs have been selected to interact with other species such as ourselves and other domestic animals.

Other animal studies have identified factors analogous to Openness to Experience and Emotional Stability of the FFM. This study failed to identify these factors. Certainly there is evidence to support the existence of these two factors in dogs and the failure to identify these factors may lie with our data sampling and analysis techniques.

## **Conclusions**

The results of this study are preliminary; however, the use of methodologies that were used to develop human models of personality has been shown to be a viable method of exploring canine personality. Principal Component Analysis revealed four personality factors. These appear to reflect dimensions which could be labeled Agreeableness, Extroversion, Conscientiousness and Social Confidence. While three of these factors are analogous to human personality dimensions from the FFM, the fourth factor, social confidence, may reflect a new construct not previously described. Thus the FFM is a useful template for characterizing personality in dogs. Additional research is currently underway to establish if the four factors can be identified in a much larger and more diverse participant study.

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**Keywords**

*dog, extroversion, personality, psychometrics*

# **Interest in the Use of a New Galenic Form of the Feline Allomarking Pheromone (F4) Analog (Felifriend) during Medical Examination**

***L. Bonnafous\*, C. Lafont, E. Gaultier, C. Falewée, P. Pageat***

## ***Introduction***

In the daily clinical practice of veterinarians, the management of cats during a medical examination is a very common burden. A good contact (or positive interaction) which could bring security, comfort and professional image of the veterinarian is often difficult to obtain with some cats.

Previous studies have shown the efficacy of the F4-fraction synthetic analog in reducing the risk of aggression and inducing friendly contact between cats and humans, especially between cats and veterinarians.

Our objective is to determine if the F4-fraction in a gel is effective in facilitating the contact between the cat and the veterinarian during a medical examination. The quality of the contact is evaluated by the restraining techniques used during a vaccine consultation.

## ***Materials and Methods***

The study is designed as a monocentric, double-blind, randomised, open clinical trial. It is being conducted in a National Veterinary School by veterinary students as investigators.

Adult cats over two years and under 10 years of age, of any breed and sex, coming for a vaccine consultation are eligible to participate in the study provided that the owner reports some difficulties in the contact between his cat and the veterinarian during the last vaccine consultation. Cats are not included if this contact

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*Phérosynthèse, Le Rieu Neuf, 84490 Saint Saturnin les Apt, France*

\*Corresponding author: [essais\\_phero@yahoo.fr](mailto:essais_phero@yahoo.fr)

was ideal or totally impossible. Approximately one hundred cats are expected to be included during the school year.

After signing the informed consent, the owner fills out a questionnaire about the history of the cat, his habits, his character, and his behaviour during the last vaccine consultation.

Prior to the first contact with the cat, the investigator rubs his hands together with a gel containing the F4-fraction or the vehicle only.

Then, he performs a standardized consultation. Four moments of the consultation have been chosen because of their importance and because the degrees of constraint they represent for the cat are very different. These different stages are carried out to obey a pre-set method: taking the cat's rectal temperature first, then inspection of the oral mucous membranes, abdominal palpation, and lastly the vaccine injection. The other stages of the examination can be performed any time as long as they take place after the taking of the temperature and before the injection.

The investigator manages the cat alone if possible. The owner is asked not to touch the cat except if the investigator asks for his help. If restraining the cat creates a problem, the owner or another student is required for help. If this proves to be inadequate, the use of gloves or a cage will be next, as well as the help of the professor.

At the end of the consultation, the investigator fills in a questionnaire in order to assess the quality of his contact with the cat by calculating scores.

The scores are obtained by grading the restraint method used during each selected phase of the consultation on a six point-scale. The global score is the total sum of the four sub-scores.

The six levels of restraint are:

- 0 = no restraint method is needed because the cat is very calm and without stress.
- 1 = no restraint method is needed but the cat is very tense and difficult to move and to palpate.
- 2 = the investigator restrains the cat with a hand laid on the body of the cat.
- 3 = the investigator restrains the cat by grabbing the pinched skin of the upper neck.
- 4 = the investigator needs someone's help to restrain the cat (the owner or another student).
- 5 = the investigator needs gloves, a cage or the help of the professor to restrain the cat.

The investigator also assesses his contact with the cat during the whole consultation on a visual analog scale.

The same evaluation is required from the owner.

## **Results**

The following are partial results, as the study is currently underway.

To date, a total of 54 cats have been enrolled in the study. 55.8 percent of the cats are neutered males, 36.5 percent are neutered females and 7.7 percent are intact females. The mean age is 4.25 years. 92.3 percent of the cats are of European type. Twenty investigators have participated.

As the expected number of cats is near one hundred, the preliminary results don't show a statistical difference between the mean global scores of the two groups. (Mann Whitney test).

Yet, the mean score of the verum group (3.56) is lower than the one of the reference group (4.24), as well as all the sub-scores except the first one, the sub-score concerning the measure of the rectal temperature.

The evolution of the restraining methods used during the consultation shows a statistical difference between the two groups. The mean differences between the first sub-score and the last sub-score of each group are statistically different according to the Mann Whitney test with a p value of 0.07 (1 d.f.;  $t = -1.707$ ). In the verum group, the evolution of the restraining methods is more important. The score decreases more in the verum group (-0,88 in the verum group/ -0.33 in the placebo group).

## **Discussion**

Only two extreme types of cats were not included. The first type is represented by the cats which are perfectly friendly with the veterinarian. These cats were not included because they can't react better with the product. The second type concerns the cats which can never be touched in such a context. In fact, they are probably not socialised to humans, they represent too high a danger for students and the product can't accomplish a miracle in a few minutes time.

All other cats can be included, so the sample is very large and representative of a general cat population coming for a vaccine consultation in a veterinary school. But, of course, only a few of these cats have real problems of management during the consultation, a lot of them are just a little afraid at the beginning of the consultation. This explains that a high number of cats is expected in order to show a significant difference.

The consultation's development is very standardized keeping up with the recommendations of the school professors.

The contact between the cat and the investigator is assessed through the choice of the restraining method since the two things are connected, the restraining method is an objective criteria, the investigators don't need special behaviour competence and it is a representative parameter for veterinarians and owners.

In the two groups, the method used at the end is less constraining than the one used at the beginning.

But, according to the statistical analyses, the restraining method evolution in the verum group is more important. That means that generally cats become easier to handle during the time of a vaccine consultation but the evolution is much more significant when the investigator has got the F4-fraction on his hands. The F4-fraction helps the veterinarian establish a good contact with the cat during the time of a consultation and this goes for a large range of cats.

## **Conclusions**

Results suggest that the use of a gel containing the synthetic feline allomarking pheromone analog during the clinical examination can be used to ease the restraint of cats and to establish a satisfactory contact with them.

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## **Keywords**

*cat, clinical examination, F4 fraction, pheromone, restraint*

# Cat (*Felis sylvestris*) Separation Anxiety in an Experimental Situation

C. Edwards, A. Tejada, M. Heiblum\*

## Introduction

The offspring of species that produce only a few young per reproductive cycle, including human beings, tend to stay close to their mothers during the first months of life. This behavior is marked by two main characteristics. The first is the young animal's efforts to maintain proximity to another animal in order to obtain protection, heat, and other basic needs. The second is the mother's efforts to stay close to her offspring to ensure their survival (Bowlby 1973). In particular, a young animal may seek proximity to another animal that is not its mother or even an inanimate object. In most species, the young and their mothers stay together. Vocal calls from the young animal attract the mother to it while the young animal's locomotive movements also restore proximity. As both types of behavior have the same result, it is useful to use the term "attachment behavior" to refer to both of them (Bowlby 1973).

By staying close to a specific person responsible for his care, a child becomes accustomed to being close to people (Ainsworth 1978). Bowlby refers to this individual as the "mother figure," which, in humans and in other animals, is usually the biological mother. Attachment provides the advantage of survival in a changing environment. Without this relationship, offspring would be separated from their mothers and would not survive (Bowlby 1973).

Attachment has been very well studied in humans and there are several definitions of attachment. The one most commonly used was presented by Mary Ains-

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*Department of Ethology and Wild Fauna—Veterinary Hospital,  
Universidad Nacional Autónoma de México, Tabachines 15, Jardines de  
San Mateo, 55604405 Mexico*

\*Corresponding author: moisesheiblum@yahoo.com

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worth and colleagues (1978) developing from the theories of John Bowlby. This definition states that “attachment is the affective and lasting bond that unites a person with another through time and space.” Applying this definition to animals can be problematic because one cannot talk easily about an “affective bond” as such, even though the study was originally based on the observation of animals.

Separation anxiety has been described and is well studied in both dogs and humans (Bowlby 1973). Separation anxiety occurs in dogs when there is an excessive attachment of the dog to its owner. When the owner is absent, even for short periods of time, the dog experiences anxiety, often manifested by urination, defecation, vocalization, and even destruction of objects (Overall 1997). This is the second most common canine behavioral problem in Mexico. Separation problems have been underestimated in cats due to the popular belief that these animals are not social. Consequently, it is thought that cats do not have the capacity to be attached to their owners in the way dogs are attached. But now it is clear that cats are not asocial creatures, but, on the contrary, they demonstrate an elastic ability to change the way they live with regard to other cats (Fogle 1995). On the other hand, the only evidence that cats also may suffer separation anxiety has been presented by Schwartz in 2001 and 2002.

The study of separation anxiety in cats is important due to the fact that the population of pet cats is increasing. For instance, in the Occidental World, there are more than a 100 million cats and the number grows each day. Thirty percent of homes in U.S. and 24 percent of European homes have a cat as a pet. In Japan, there are more than 3.5 million of them (Edney 1993).

Because of the controversy over whether separation anxiety exists in the cat, this study is a first attempt to clarify the attachment behavior of cats toward their owners. If attachment behavior exists, one can affirm the idea that there can be a close bond between cats and their owners, which could lead to separation anxiety. The object of this study is to identify attachment behavior of cats to their owners in an experimental situation.

## ***Materials and Methods***

### **Location and subjects**

This study was carried out in the Departamento de Etología, Fauna Silvestre y Animales de Laboratorio (DEFSAL) de la Facultad de Medicina Veterinaria y Zootécnica (FMVZ) de la Universidad Nacional Autónoma de México (UNAM) in Mexico City. A 3m × 2m room with two chairs was used. A toy for the cat was provided on the floor across from the door and a string with a ball was provided so that the owner could play with the cat. A one-way mirror was situated on the left upper side of the room. Experimental subjects were selected after placing advertisements in veterinary clinics in the Cat Exposition of the Asociación Gatofila Mexicana y the

Asociación Mexicana de Gatos in the FMVZ of UNAM. Cats that came to the Veterinary Hospital of FMVZ UNAM were also used.

Three pilot trials were performed with different cats in order to define a catalogue of behaviors to be measured. Twenty-eight cats between the ages of 1 and 7 years were enrolled. This age range was chosen because these are the ones that can show more signs of separation anxiety based on Schwartz's clinical description (2002). Representatives of the various breed types were included without consideration of sex or whether they were neutered. The breeds included 15 domestic Europeans, 1 Maine Coon, 6 Persians, and 6 Siamese. A total of 57.14% of the subjects fell into the muscular group (37.5% female, 62.5% male); 21.43% were in the Coby group (83.3% male, 16.7% female); and finally, 21.43% were Orientals (66.6% female, 33% male). A total of 78.57% of the cats were neutered and 21.43% were intact.

### **Experimental design**

The Ainsworth Modified Strange Situation Test (Ainsworth et al. 1978) was adapted to be used in cats. The procedure had a duration of 21 minutes, consisting of 7 experimental events, each lasting 3 minutes, following an introduction event of 30 seconds.

Introduction Event (30 seconds approximately) The observer introduces the owner and the cat to the experimental room and leaves them there.

Event 1. (3 minutes) Owner and Cat. The owner does not participate while the cat explores. At 1.5 minutes a signal (knock in the door) is given to the owner to stimulate play.

Event 2. (3 minutes) Stranger, Owner and Cat. Stranger comes in and sits, after 30 seconds she starts a conversation with the owner, at the two minute mark the stranger plays with the cat and the owner leaves without interrupting.

Event 3. (3 minutes) Stranger and Cat. This is the first episode of separation. The stranger's behavior is focused towards the cat. During the first minute the stranger tries to attract the cat's attention and to separate him from the door by playing. If the cat is not ready to play, the stranger tries to get his attention with caresses. At the 2 minute mark, the stranger stops the play; however, if the cat seeks contact, it will be allowed.

Event 4. (3 minutes) Owner and Cat. This is the first episode of reunion. The owner approaches the closed door and calls the cat. The owner opens the door and waits for the cat to respond. The owner rewards and comforts the cat. In the meantime, the stranger leaves. After 2 minutes the owner leaves.

Event 5. (3 minutes). Cat alone. This is the second separation episode.

Event 6. (3 minutes) Cat and Stranger. This is follow up of the second separation. During the first minute, the stranger tries to attract the cat's attention to separate him from the door by play. If the cat is not ready to play, the stranger tries to call this attention by caressing him. At the 2 minute mark the stranger stops the game; however, if the cat seeks contact it is allowed.



Event 7. (3 minutes) Owner and Cat. This is the second reunion episode. The behavior of the stranger is focused toward the cat. The owner opens the door and stops a moment before rewarding the cat, giving him an opportunity to respond spontaneously, and then he caresses him. In the meantime the stranger leaves.

Some instructions are given to the stranger, who, in all cases, will be the same woman (Topal et al. 1998). The owners are unaware of the purpose of the study and the hypothesis. They are told that the study is to see how their cats behave in a strange situation.

### **Data collection**

To determine the kind of attachments in infants using the Strange Situation Test, the following encounter episodes are evaluated: with the attachment figure (episodes 4 and 7), with the stranger (episode 6), and the infant alone (episode 5) (Ainsworth et al. 1978). The same approach is used in the present study. An average was taken in order to obtain the corresponding information of the behavior of the cat with the owner (episodes 4 and 7), with the stranger (episode 6) and alone (episode 5). This yields six minutes of observation with the owner, 3 minutes with the stranger, and 3 minutes alone; a total of 12 minutes of observation per cat.

A focal samples with continuous recording was used in order to obtain information about the time and the frequency of the individual and social behavioral events. The recording was made by the program "Registro Conductual Computarizado."

Direct observations of the cat's behavior were made. The sessions were studied using several behavioral categories which were divided into social behavior and in individual behavior: Some of these behaviors were considered states of behavior (proportion of time that the cat was performing the behavior) and others were considered as events (frequency with which the cat performed the behavior). For physical contact and vocalization, latency was recorded (times it takes for a behavior to be performed).

### **Individual and social behavior**

**Locomotion/Exploration:** Search and active investigation of new situations in absence of an urgent necessity, including movement from one place to the other. Activity is addressed to objects or persons present, including smelling or oral inspection, and is considered a state of behavior.

**Vigilance:** A state of alertness, being prepared to detect events that could be a danger to the animal or his company. The cat is standing, sitting or lying down and is making movements with his ears, has a tense body posture, and is looking in a specific direction. This behavior was considered an event.

**Inactivity:** Standing, sitting or lying down without any movement or gesture. This is considered a state of behavior.

**Coming near the door:** Behavior directed toward the door, including approach,

touch, staying still or lying down close to the door. This behavior is considered an event.

Play: Any interaction involving predatory postures. It could be with the owner, stranger or with an object. This behavior is considered an event.

Physical contact with owner or stranger: This behavior was considered a state of behavior and its latency was recorded.

Following owner: This behavior was considered an event.

Marking: rubbing face or body against an object or person: This was considered an event

Vocalizing: "Meowing" was considered an event.

### *Statistical analysis*

Nonparametric tests in the "Statistica" computer program were used. (<http://www.statsoft.com/>)

a. Friedman Test: This was used to compare behavioral categories among episodes when the cat was with the owner, alone, and with a stranger.

b. Wilcoxon Test: This was used to compare behavioral categories separately between the episodes when the cat was with the owner versus with the stranger, with the owner versus alone, and with the stranger versus alone.

## **Results**

The categories of behavior were compared between the episodes with the owner present, the episodes when alone, and the second encounter with the stranger. Significant differences were obtained in the amount of time spent in locomotion/ exploration between the episodes. The total time spent in locomotion/ exploration with the owner present was 19%, 7% when alone, and 13% with the stranger present, ANOVA ( $F = 13.55$ ,  $p < 0.001$ ). The frequency of vigilant behavior with the owner present was 1.67 events/minute, 3.75 events/ minute with the cat alone, and 1.80 events/ minute with the stranger present, ANOVA ( $F = 7.44$ ,  $p < 0.05$ ). Significant differences were also found in the proportion of time spent in inactivity. When the owner was present, the cat spent 9% of its time in this behavior, 27% when left alone, and 23% with the stranger present, ANOVA ( $F = 6.14$ ,  $p < 0.05$ ).

## **Discussion**

The objective of this work was to demonstrate that there is an observable attachment of cats to their owners. In addition, variables such as breed and sexual status (neutered vs. intact) were analyzed to determine if they influence attachment behavior.

Significant differences were obtained in the proportion of time the cats spent in locomotion/exploration in the Owner, Alone, or Stranger episodes, with the cats spending more time in locomotion/exploration when they were with the owners compared with when they were left alone or were with the stranger. Locomotion is

an attachment indicator, noted in phase 3 of the formation of an attachment. In addition to being part of other behavior systems, locomotion is used by the human infant when his favorite figure approaches, when he follows her while she is leaving, when he welcomes her when she returns, or simply when he seeks to be near her (Bowlby 1973). These same movements were observed in the cats in this study. Exploration is also an indicator that the cat forms an attachment because the cat uses its owner as a security base of exploration, as is seen in children who have a secure attachment. Inside this phase 3, the boy explores his environment, manipulates objects, discovers and learns its properties, and is not constantly centered on his attachment figures. These attachment figures provide security from which he can move to strange places in his world (Ainsworth et al. 1978). This model explains why the cats explored more in the presence of their owners when compared to when they were alone or with a stranger. Exploration, obtaining achievements, and risk-taking are also believed to be linked to attachment.

In models of security attachment in primates, the mother or primary caretaker provides a “secure base” from which the infant learns to explore his world and acquires security and stability in his relations with others. These ideas are also presented in the literature with regard to behavioral problems in dogs (Borchelt and Voith 1982). The results in the present study are compatible with the ones found by Topal et al. (1998), where dogs tended to play more and spend more time exploring in the presence of the owner in comparison to when they were in the presence of a stranger.

Significant differences were obtained in the frequency of vigilance behaviors recorded in the episodes of Owner, Alone, and Stranger. There was a lower average frequency with the owner, higher when alone, and, when with the stranger, a small increase was noted when compared with the owner episode. This indicated that cats were most secure with their owners, a little less so with strangers, and most anxious when alone.

As to the amount of time the cats spent in inactivity, there was less time spent in this state when the cats were with their owners and more time spent when the cats were alone or with a stranger. This is compatible with states of anxiety and could be considered to be “freezing,” which is one of the ways in which panic and/or anxiety are expressed in cats and dogs (Overall 1997). In Topal et al. (1998), no differences were found in passive behavior in dogs when they were with their owners compared with strangers. On the other hand, it has been said by Carlstead and others, that there is a decrease in exploration and an increase in hiding correlated with physiological measures of stress in studies involving large felines in captivity. Behavioral studies in domestic cats by Rochlitz and others have revealed a decrease in general activity (walking or running), exploration behavior (smelling or rubbing), and grooming associated with high levels of serum cortisol. Other studies with domestic and non-domestic felines list behavioral indifference—hiding and low levels of activity—as indicators of stress (Kessler and Turner, 1997). In addition, studies involving hu-

mans and other species indicate that an increase in sleep requirements can be a sign of biological or physiological stress. These observations suggest that cats with separation anxiety may be less likely to present with destructive behavior or inappropriate elimination in comparison with dogs. Instead, cats may be more likely to show a decrease in the general activity—hiding or even sleeping—as signs of stress or anxiety. Consequently, owners may not be aware that their cats are distressed in their absence because they do not find anything out of the ordinary upon their return.

It is well known that cats are easily stressed. For instance, simply changing an object or piece of furniture in the house can produce an anxiety response in them. In fact, it is popularly held that cats do not attach themselves to their owners but to their houses, since territory is more important to them. There are anecdotal stories of cats returning to their original houses even if the owners move miles away.

When the adapted Test of Strange Situations was administered to these cats, it was anticipated that the cats would be in a state of stress simply because they were taken away from their home territory and put in a strange environment. This response is true even for dogs, since it has been demonstrated that introduction into a new environment increases the sympathetic activity and stimulates the hypothalamic-pituitary-adrenal axis. When the cats were removed from their routine environment, the following behaviors would be expected because of their increased anxiety: A) they would be inactive and look for a place to hide; B) they would look for their owners as a security base (attachment theory); and C) they would look for any person, without discriminating, as a refuge.

The results obtained in this study suggest that cats do manifest attachment behaviors toward their owners and, therefore, are capable of developing separation anxiety.

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**Keywords**

*anxiety, cat, experimental, Mexico, separation, strange situation*

# The Effect of Hypothyroid Function on Canine Behavior

L. P. Aronson\*, W. J. Dodds

## Introduction

In human medicine, a wide range of behavioral symptoms have been reported in hypothyroid patients. In the early stages of the disease, reduced cognitive function and concentration, together with impaired short-term memory, may be easily confused with attention deficit-hyperactivity disorder (AD/HD) (Hauser et al. 1993). Visual and auditory hallucinations can be mistaken for schizophrenia or psychosis. Fear—ranging from mild anxiety to frank paranoia; mood swings; and aggression have also been reported in hypothyroid patients (Denicoff et al. 1990). We have seen a comparable range of behavioral manifestation in dogs (*Canis familiaris*), particularly in those whose hypothyroidism has not progressed to the more traditional skin, coat and metabolic changes characteristic of the condition.

Thyroid hormones modulate the activity of norepinephrine (Heal and Smith 1988), serotonin (Bauer et al. 2002) and their receptors (Sandrini et al. 1996). In hypothyroid animals, 5-HT turnover increases in the brainstem, while cortical 5-HT concentrations and 5-HT<sub>2A</sub> receptor density may decrease. Administration of thyroid hormone to hypothyroid animals increases cortical 5-HT concentration and desensitizes autoinhibitory 5-HT<sub>1A</sub> receptors in the raphe area, thereby disinhibiting cortical and hippocampal 5-HT release. There is also evidence that thyroid hormones increase the sensitivity of 5-HT<sub>2</sub> receptors (Bauer et al. 2002).

In human medicine, thyroid hormones are frequently used to accelerate the anti-depressant effect of tricyclic antidepressants and selective serotonin reuptake inhibitors, which can often take 3 or 4 weeks to produce a noticeable psychiatric ef-

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\*PetShrink, 117 Lyman Rd, Berlin, MA 01503, USA

Hemopet, 11330 Markon Dr, Garden Grove, CA 92841, USA

\*Corresponding author: [dvm@petshrink.com](mailto:dvm@petshrink.com)

fect (Sandrini et al. 1996; Altshuler et al. 2003). Gur et al. (1999) demonstrated that in rats (*Rattus norvegicus*) administration of triiodothyronine (T3) for 7 days at a dose of 0.1 mg/kg SQ q 24h resulted in comparable elevation of basal 5-HT levels in the frontal cortex to those achieved after 4 weeks of clomipramine at a dose of 10mg/kg IP q 24h. Thyroid hormones may also be given to supplement the effect of antidepressants when they are not achieving the desired effect.

Deficiencies of thyroid, adrenal cortex and sex hormones impair learning and the ability to store memories and behave normally. The adrenal hormones are directly involved in learning and behavior, while thyroid and sex hormones appear to modulate learning, memory and behavior at a higher level (Fedotova 2000). Hypothyroidism often reduces cortisol clearance. Conversely, glucocorticoids inhibit TSH release in response to thyrotropin releasing hormone (Otsuki et al. 1973), reduce conversion of T4 to T3 (Chopra et al. 1975) and have direct effects on the thyroid gland itself (Kempainen et al. 1983), so that stress could further diminish the function of a suboptimal thyroid. The thyroid-adrenal axis could be expected to affect behavior at all levels.

## **Materials and Methods**

### **Diagnosis**

Simply relying upon the total thyroxine (T4) test alone has been shown to give misleading results in an estimated 40 percent of dogs (Dodds 1997), whereas 62 percent of dogs were misdiagnosed with an in-house ELISA test kit (Lurye et al. 2002). Likewise, the canine thyroid stimulating hormone (cTSH) test produces false positive and negative results between 20 and 40 percent of the time, and so is considered to be only 70 percent predictive of primary canine hypothyroidism (Iversen et al. 1999; Marca et al. 2001). Complete thyroid profiling (total and free T3 and total and free T4 levels, as well as circulating levels of thyroglobulin autoantibodies (TgAA), and T3 and T4 autoantibodies) should be performed. However, this information must be examined in conjunction with clinical evaluation of the animal. Reference ranges offered by most laboratories do not adequately address the disparate needs of different groups of dogs. Basal levels should be higher in toy and small breeds and somewhat lower in giant or very large breeds as well as sight-hounds (Dodds 1995; Gaughan et al. 2001; Hill et al. 2001). Basal levels should be higher in young dogs (up to about 18 months of age) and lower in geriatric animals (Wolford et al. 1987; Dodds 1995). A variety of circumstances can affect the optimal thyroid levels for an individual. These would include athletic/performance activities (Evason et al. 2004); altered levels of sex hormones—due to such causes as estrous, pregnancy or lactation; obesity; sickness or recent recovery from illness; vaccination; anesthesia or drugs that may influence thyroid function—corticosteroids, phenobarbital, potentiated sulfonamides, dietary soy or soy phytoestrogens, insulin, narcotic analgesics, salicylates, tricyclic antidepressants, furosemide, phenylbutazone and mitotane (Dodds 1995,

1997). Superimposed upon these effects are daily diurnal fluctuations in hormone levels. It is possible to accurately assess thyroid function in the face of these conditions, but they cannot be ignored.

## Subjects

Thyroid function data were obtained for more than 1500 dogs presented to veterinarians for a range of behavioral problems. Some dogs were referred to the authors for treatment; others we consulted on but did not see personally. Thyroid function was determined based on laboratory results, clinical presentation, and other factors as described above. While some dogs would be deemed hypothyroid by any laboratory, others would be described as borderline or having suboptimal thyroid function. The reference ranges used for adult dogs are as follows: TT4 optimal range 2–4 ug/dL; free T4 optimal range 1–3ug/dL; TT3 optimal range 50–150 ng/dL; free T3 optimal range 3–8 pg/dL; T4 AA <2.0; T3 AA <2.0; TgAA <20. However, depending upon the specific case demographics, these may vary. There are different optimal ranges for puppies, geriatrics, large/giant breeds and sight-hounds. These optimal ranges have been developed over 20+ years of data collection and analysis by the second author. Cases were considered ‘borderline’ when some of the analytes of the profile were below the optimal ranges, but other analytes were within the lowest end of the optimal reference ranges. Follow up was obtained on one or more occasions with post-treatment complete thyroid profiles and interviews with the referring clinic and/or client. This is an on-going study and earlier reports have been made on some of these data (Dodman et al. 1995; Aronson and Dodman 1997; Dodds 1997, 2004; Aronson 1998; Dodds and Aronson 1999).

## Results

Of the 1500 cases presented for behavioral problems, 921 (61%) were determined to be hypothyroid or have suboptimal thyroid function using the determined criteria. Statistical analysis of the first 499 cases using neural network correlative analysis has been undertaken and showed a highly statistically significant relationship between thyroid dysfunction and dog-to-human aggression ( $p = <0.001$ , with a suggestion of a trend also towards dog-to-dog aggression ( $p$  slightly  $> 0.05$ ). Other behavioral associations remain to be analyzed. Spayed and castrated animals are at greater risk than intact ones; mid sized and larger breeds are also more likely to be affected; the incidence is far greater in purebred dogs.

Treatment was recommended with levothyroxine sodium at a dose of 0.1mg/5.5 – 7.0 kg body weight, *per os*, q12h. (Doses were adjusted to allow for age, breed and other factors affecting the individual dog.) Follow up was not available for all cases referred. In those for which it was available, approximately 62 percent showed greater than 50 percent behavioral improvement (36 percent showed more than 75 percent improvement to complete resolution of the problem), 25 percent showed be-



tween 25 and 50 percent improvement, 10 percent failed to improve and 2 percent got worse. A favorable behavioral response to thyroid replacement therapy was usually apparent within the first week of treatment, although metabolic deficits were not corrected for three weeks, and skin and coat issues could take months to resolve.

## **Discussion**

### **Behavioral presentations**

In dogs, as in humans, hypothyroidism appears to present as impaired mental function; reasoned behavior is lost in favor of a panicked response. In general, behavioral problems are most noticeable when the animal is psychologically or physiologically stressed. The behaviors displayed by hypothyroid dogs fall into several distinct patterns.

In some animals problems appear at a very early age (6 months or less). They generally show poor or variable attachment to their owners, and they are difficult to train. Behaviors are lost from one training session to the next. Owners often describe these dogs as appearing to have AD/HD. These dogs may become fixated on one activity—such as playing Frisbee—and only value their owners' presence for providing this.

Perhaps more common is the dog that exhibits a sudden change of personality and behavior at puberty or as a young adult. It may be that this is the age at which owners become more aware of the behaviors as the animal is larger and more difficult to live with, and odd behaviors that may be tolerated in a puppy become less endearing. Neutering usually has little or no effect on the behaviors, which may intensify as the dog ages. While certain breeds are over-represented, and distinct familial patterns may be observed, breed or lack thereof, cannot rule the condition out. Those breeds most represented include those in which allergies and other immune problems are also most common. These would include: English Setter, Golden Retriever, Akita, Rottweiler, Doberman Pinscher, English Springer Spaniel, Shetland Sheepdog, and German Shepherd Dog. Like their younger cohorts, these dogs may show few, if any, signs of being hypothyroid other than behavioral ones. As opposed to being lethargic and obese, these dogs are often underweight and hyperactive. Many have a worried or tragic appearance. They may have seasonal allergies; recurrent skin, ear and foot infections; shed excessively; and/or chronic gastrointestinal problems. Some of these dogs present with a sudden onset of aggression—usually owner directed or intraspecific. Others will become fearful, whining incessantly, and showing nervousness in new situations or around strangers; they may hyperventilate and sweat excessively. Their fear may also lead to aggression. Some dogs develop apparently obsessive behaviors such as tail chasing and pacing.

These same changes can occur in adult dogs. Separation anxiety may appear suddenly. Noise phobias—particularly thunderstorm phobia—most commonly arise in this group. This is also the stage at which some dogs start to show other signs of

hypothyroidism—lethargy, weight gain, reduced energy, change in the character of the bark. Superstitious behaviors—watching the ceiling or wall for no apparent reason, refusing to walk on particular surfaces—may appear. Episodic dyscontrol and other behaviors related to partial seizures are also seen. Although not a behavioral phenomenon per se, tonic clonic seizure activity is also commonly related to hypothyroidism. Particularly noticeable in performance and service dogs, some will lose concentration and no longer be able to perform at their previous skill level.

Older dogs may suddenly become irritable and show aggression, food guarding and other behaviors at complete odds to their younger selves. They sleep more, seek out heat sources, and show reduced scenting, hearing and visual acuity. While these signs might be attributed to advancing age or even cognitive dysfunction, they will resolve with treatment of the hypothyroidism along with the behavioral problems.

The prevalence of hypothyroidism within the canine population is unknown, but is estimated in some breeds to be as high as 40 percent, and there is evidence that it is increasing (Dodds 1995). A recent study (Hamilton et al. 1998) compared total T4 and cTSH levels between a group of 21 bearded collies with no overt signs of hypothyroidism or aberrant behaviors (control group) with an experimental group of 22 bearded collies of similar age and sex distribution that exhibited problem behaviors but also showed no signs of hypothyroidism. Fifty-two dogs were excluded from the study because they exhibited signs of hypothyroidism, of these 34 had behavioral signs as well. Total T4 levels were significantly lower ( $p = 0.01$ ) in the experimental group when compared to the control group. The behaviors exhibited by the experimental group included noise and thunderstorm fears; fearful/anxious/shy behavior; separation anxiety; hyperactivity; poor concentration/learning; compulsive behaviors; mood swings, irritability and aggression—primarily territorial. We have seen more owner directed and dog-to-dog aggression, but otherwise behaviors seem similar to those we have found. Beaver and Haug (2003) also report owner directed aggression as a result of hypothyroidism.

We have seen a wide range of problem behaviors in dogs that are clinically hypothyroid or have suboptimal thyroid function. Some in this latter group appear completely healthy and others show minor problems such as seasonal allergy, ear infections, skin and coat disorders, etc. Many of these dogs responded to thyroid replacement on a twice-daily dosing regimen. In some cases, the dogs have been treated with a variety of other psychoactive drugs prior to presentation, as well as a number of other medical regimens. In general, such treatment was unsuccessful. While we know that thyroid can exert an effect on behavior by affecting levels of serotonin and norepinephrine, it would seem there are other mechanisms involved in producing some of its behavioral effect. Given that levels of endogenous glucocorticoids inhibit thyroid hormone production and release, as well as the conversion to the active form, it is not surprising that in dogs with borderline and suboptimal thyroid function, stress will induce a truly hypothyroid state that manifests initially in behavioral problems.

Our results suggest that thyroid replacement has an important role in the treatment of canine behavior, just as it does in human psychiatry. Therapeutic doses of levothyroxine are not harmful, provided any withdrawal of treatment is made gradually; wider use of such therapy could be beneficial to many dogs. In our opinion, it would be prudent to include a full thyroid panel in the work-up of most, if not all, behavioral cases.

### **Acknowledgement**

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**Keywords**

*aggression, behavior, dog, fear, hypothyroidism, learning*

# **Stress Symptoms Caused by the Use of Electric Training Collars on Dogs (*Canis familiaris*) in Everyday Life Situations**

***E. Schalke*<sup>\*1</sup>, *J. Stichnoth*<sup>1</sup>, *R. Jones-Baade*<sup>2</sup>**

## ***Introduction***

The use of electric collars for training dogs is the subject of considerable controversy. Supporters claim they are a reliable means of eliminating self-rewarding behaviour (Christiansen et al. 2001) that can be used over greater distances and with less risk of stress and injury than mechanical devices, such as choke chains. Opponents cite risk of incorrect or abusive use and temptation to use electric shock collars without thought or time given to alternative training methods, regardless of the fact that their use is associated with pain and fear (Schilder and van der Borg 2003). The aim of this study was to investigate the stress caused by the use of electric collars towards contributing to the welfare implications of their use.

## ***Materials and Methods***

To minimise experiential variation, five female and nine male beagles that displayed hunting behaviour were chosen from a University laboratory's breeding stock (n = 25) and trained by the same trainer. All training and tests were carried out in one room, 11.10m long and 5.20m wide, in a building situated 120m from the Beagle's kennels. Prey was simulated using a dummy rabbit attached to an 11m line and self-retracting horizontal winch released by a button controlled by the same person, other than the trainer, on each occasion. The electric collar used was a "Teletakt mi-

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<sup>1</sup>*Department of Animal Welfare and Behaviour, Veterinary School of Hannover, 30559 Hannover, Germany*

<sup>2</sup>*Clemensstr. 123, 80796 München, Germany*

\*Corresponding author: [schalke@tiersschutzzentrum.de](mailto:schalke@tiersschutzzentrum.de)

cro 3000". Current, voltage and duration of impulse were measured using resistances between 500  $\Omega$  and 2.2 k $\Omega$ , to simulate the skin resistance.

Heart Rate was measured using a Polar® Horse Trainer Transmitter and Polar® Vantage NVTM heart rate measuring instrument. After activation, the receiver averaged the heart rate and recorded a value in beats per minute every five seconds.

Secretion of saliva from test subjects was stimulated with citric acid and samples taken from the dogs' cheek pouches with a cotton bud made by Salivette® Systems. A radio-immuno-assay with Tritium-marked cortisol and auto-antibodies was used to measure cortisol values. The repeatability rate was > 95%.

The dogs were divided into 3 groups:

Group A: ("Aversion") Five dogs received an electric shock at the moment they touched the prey to form an association between touching the prey and the electric shock.

Group H: ("Here") four dogs trained to recall received an electric shock when they did not respond.

Group R: ("Random") five dogs received an electric shock arbitrarily to assimilate poor owner timing. The shock was administered unpredictably, either prior to orientation towards the prey, while hunting, after the hunting process i.e. when the prey had been removed. Which of these to be used was decided by drawing lots.

### **Adaptation phase**

All dogs initially experienced a three month long adaptation phase during which they were trained to successfully hunt (chase) the dummy rabbit in the room. Dogs in group H were additionally trained to recall at the verbal signal "Here". Each dog worked once a day with a maximum of a 1.5 hour variation of their allotted timeslot.

### **Main experiment**

To determine basal levels for salivary cortisol and heart rate, each dog was led into the room. After 50 minutes, continuous heart rate measurement was started and a total of five saliva samples were taken at five minute intervals.

A preliminary test was undertaken during two periods of five days. During the first, called "Simple Hunting", each animal was allowed to hunt unimpeded. During the second period, called "Hunting Impeded", the dogs were prevented from hunting by using a leash. Ten minutes after each hunting sequence, five saliva samples were taken at five minute intervals. Heart rate was measured throughout both periods.

During the main experiment, electric shocks were administered to the dogs according to their group. Experimentation for each individual was terminated if it did not show interest in the prey for three consecutive days, obeyed the recall signal, displayed distinct signs of stress or after the third application of an electric shock. Saliva sampling and heart rate measurement were carried out as in preliminary testing.

Four weeks after the main experiment the dogs were returned to the room. Five saliva samples were taken at five-minute intervals and heart rate was measured.

## Data Processing

The cortisol values gained directly from the saliva samples were called “Absolute Cortisol Values”. In order to exclude the influence of individual cortisol, cortisol values were divided by the averages during the “Simple Hunting” period. The values gained in this way were called “Relative Cortisol Values”.

Heart rate curves were divided into three minute segments because each original curve contained some fluctuation. The average was calculated for each segment and this produced a new, smooth curve. Key values on these graphs were:

- “Max”. The maximum value of heart rate at the time the electric shock occurred.
- “Mw15”. An average value from measurements taken from a 15 minute period that commenced 15 minutes after the stressor had occurred.
- “Max/Mw15”. The ratio between “Max” and “Mw15”. This balanced for possible individual heart rate levels.
- “Max-Mw15”. The period of time between “Max” and “Mw15”.

The entire curve during the measurement of base levels and post-test was measured.

Datasets were compiled according to the number of days electric shocks were administered, depending on the dog’s reaction to the treatment:

- “r1-r3, n1”: Three days of electric shock application and the first day without shock.
- “r1-r2, n1-n3”: Day 1 and 2 with application of electric shock, and day 1, 2 and 3 without shock.
- “r1-r2, n1”: Day one and two with application of electric shock and day one without shock.
- “r1, n1-n3”: Day one with application of the electric shock, and day 1, 2 and 3 without shock.

In addition all dogs were included in a set “r1, n1” which contained data for day one with application of the electric shock, and day one without .

### *Statistical analysis*

The statistics programme SIGMASTAT® and EXCEL 97 was used for analysis. A significance level of  $p < 0.05$  was used for all tests.

When comparing results of two dogs, a t-test for unpaired comparison was used. The Mann-Whitney U-Test was used in cases where the data were not normally distributed.

When comparing results of more than two dogs, a one-way ANOVA was used. The Kruskal-Wallis H-Test was used if the data were not normally distributed.



When comparing single dog data collected on two different days, a paired t-test was used. The Wilcoxon-Rank Test was applied if the data were not normally distributed.

When comparing a single dog's results gathered on more than two days, a one-way or two-way ANOVA for repeated measurements was used. If the data were not normally distributed, a one-way ANOVA for repeated measures (FRIEDMAN) was performed. If significant differences were detected, the data were compared using Tukey-test or Dunn's test.

## **Results**

Some dogs stopped hunting after the first application and could not be stimulated to hunt in the following trials, some after the second or third application. Dogs in the different data sets were as follows:

- “r1-r3, n1” : Two dogs from group R and from one dog from group A.
- “r1-r2, n1-n3” : Three dogs from each group.
- “r1-r2, n1” : Four dogs from group A, three from group H and five from group R.
- “r1, n1-n3” : Four dogs from group A, four from group H and three from group R.
- “r1, n1” : All dogs.

“Base level” saliva cortisol was higher than levels measured during the period “Simple Hunting.” Therefore the values collected for each dog during “Simple Hunting” were averaged and used as its reference value. “Mw15” values were chosen as heart rate reference values.

### **Comparison of “simple hunting” and “hunting impeded” in general**

“Absolute Cortisol Values” and “Relative Cortisol Values” during the period “Hunting Impeded” were significantly higher than during “Simple Hunting” ( $p \leq 0.001$  and  $p \leq 0.001$ ).

### **Comparison of “simple hunting” and “hunting impeded” between groups**

The “Absolute Cortisol Values” of group H during “Simple Hunting” were significantly smaller than those of groups A and R ( $p < 0.05$ ). During “Hunting Impeded”, the “Relative Cortisol Values” of group R were significantly smaller than those of groups A and H ( $p < 0.05$ ).

No significant differences in heart rate were found.

## **Comparison of saliva cortisol values in the main experiment**

### **Dataset “r1–r3, n1”**

Comparison between the groups: Considering the four days “r1”, “r2”, “r3”, and “n1” altogether, “Absolute Cortisol Values” and “Relative Cortisol Values” of group R were significantly higher than those of group A ( $p < 0.05$  and  $p < 0.05$ ). Considering only day “r1”, no significant difference between the values for group A and those for group R was detected (difference of averages [MW-Diff.] 0.39 ng/ml). Considering the other three days, “r2”, “r3”, and “n1”, the “Absolute Cortisol Values” for group R were significantly higher than those for group A (MW-Diff 2.57 ng/ml, 2.94 ng/ml, and 1.87 ng/ml).

Comparing the different days an electric shock was applied, in group A no significant difference was detected. However, the highest value was measured on day “r1”. In group R, the values recorded on day “r3” were significantly higher than those recorded on day “r1” (MW-Diff 2.70 ng/ml) and those recorded on day “n1” (MW-Diff 1.19 ng/ml). Additionally, the values recorded on day “r1” were significantly lower than those recorded on day “r2” (MW-Diff 2.34 ng/ml) and those recorded on day “n1” (MW-Diff 1.50 ng/ml).

Altogether, the results described above show a continuous increase in “Absolute Cortisol Values” for group R from day “r1” until day “r3”. On day “n1”, the values show a decrease, however, the value is still higher compared to the day that the first electric shock was administered.

### **Datasets “r1–r2, n1–n3”, “r1, n1–n3” and “r1–r2, n1”**

Concerning both “Absolute Cortisol Values” and “Relative Cortisol Values”, the results collected from group “R” were significantly higher than those from groups A and H ( $p < 0.05$ ). Furthermore, the “Relative Cortisol Values” of group H were significantly higher than those of group A ( $p < 0.05$ ).

### **Dataset “r1, n1”**

Concerning both “Absolute Cortisol Values” and “Relative Cortisol Values”, the results taken from group R were significantly higher than those taken from both groups A and H.

## **Comparison of heart rate values**

### **Datasets “r1–r2, n1”, “r1, n1” and “r1–r3, n1”**

For these datasets no significant differences in heart rate were found.

### **Dataset “r1–r2, n1–n3”**

Concerning the key values “Mw15”, “Max/Mw15”, and “Max-Mw15”, no significant differences were found between the groups of dogs or between the different days of the experiment. Concerning “Max”, an increase in heart rate from day one

with application to day three with application was found in group R. The heart rate on the second day of application was significant higher than the first day.

### **Dataset “r1, n1-n3”**

The values of “Mw15” on the second day without application was significant higher ( $p < 0,05$ ) than on the third day.

### **Comparison of saliva cortisol values post-test**

“Absolute Cortisol Values” were significantly different between all groups ( $p < 0,05$ ) ( $R > A$ ;  $R > H$ ;  $H > A$ ). Significant differences in “Relative Cortisol Values” were found between groups R and A ( $R > A$ ) and H and A ( $H > A$ ).

### **Comparison of heart rate values**

No significant differences between the groups of dogs were found.

### **Comparison between preliminary test, main experiment, and post-test**

For statistical reasons, only day “r1” and day “n1” were considered.

Within group A, significant differences were found in “Absolute Cortisol Values”. The values collected on the fifth day of the period “Hunting Impeded” were significantly higher than the values recorded during the post-test. No significant differences were found in “Relative Cortisol Values”.

Within group H, post-test “Absolute Cortisol Values” and “Relative Cortisol Values” were significantly higher than those recorded on the second and third days of the period of “Simple Hunting”. Cortisol levels measured during the preliminary test were not reached during the post-tests. “Absolute Cortisol Values” and the “Relative Cortisol Values” for group R, during the post-test were higher than those gathered throughout the preliminary test and the first day of application of the electric shock.

## **Discussion**

Significantly, on the days of stimulus application, an increase in heart rate to “Max” was reached in group “R”. In groups A and H a decrease occurred. The animals in group R had no opportunity to associate their behaviour or a warning signal, such as the “recall”, and the punishing stimulus. This can be the explanation for the increase of heart rate on the days of stimulus application.

The results of cortisol testing following application of shock show the least increase in absolute and relative values (between 22.5% and 31.3%) in group A. This is even lower than in the case of “hunting impeded”, which can only be found in this group. Group H had an increase of up to 113.9 percent in absolute cortisol level and up to 160 percent in relative cortisol value. The highest increase was seen in group R, up to 336.4 percent in absolute cortisol value and 327.8 percent in relative cortisol value. The values of group R are significantly higher in each set of data than those of group H and A. In the data set r1, n1, the relative cortisol values are signifi-

cantly higher in group H than those of group A. However, the dogs of group A were able to associate the prey with the application of the stimulus and were able to predict and to control the stimulus, explaining the lowest increase of only up to 31.3 percent in relative cortisol values.

In group H the signal “Here” had been trained but not in conjunction with prey. Resulting from this lack in training, while application of the stimulus could be predicted by the dogs, they were not able to know how to control their reaction—i.e. avoid chasing the prey. This might be the reason for the increase in relative cortisol values 160 percent. However, the increase was not as high as that of 327.8 percent in group R.

The animals in group R were neither able to control nor predict the stimulus due to its random application. The percentage increase is similar to the values and the conclusions found in the literature that is concerned with unpredictable stressors (Feddersen-Petersen and Teutsch 1999).

## **Conclusion**

The results of this study indicate that the general use of electric shock collars is not consistent with animal welfare. It has to be assumed that pet owners do not have sufficient knowledge about training and skill to avoid the risk that dogs will show severe and persistent stress symptoms. For professional dog trainers the use should be restricted: proof of theoretical and practical qualification should be required and the use of these devices should only be allowed in strictly specified situations.

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## **Keywords**

*collar, cortisol, dog, electric, stress*

# **Stress in Avalanche and Rescue Dogs (*Canis familiaris*) during Search Work**

***M. Schneider\*, F. Köhler, M. Erhard***

## ***Introduction***

For decades, rescue dogs have been successfully used in search work for missing persons or persons who were buried by an avalanche. Despite the development of technical detectors, search and rescue dogs remain indispensable because they are the most rapid way to find missing persons in rough and dangerous terrain. However, studies evaluating the impact of this work on search and rescue dogs are rare (Grandjean et al. 1998, Shivik 2002, Slotta-Bachmayr 2003). These studies mostly deal with the effects of the environment, the altitude and the nutritional requirements. Some studies analysed the stress in dogs while searching for drugs or explosives (Strasser et al. 1993, Gazit and Terkel 2003). Results can not be applied to search and rescue dogs since these dogs have to search great spaces and are required to cover greater distances when compared to drug or explosive sniffing dogs.

Our study was designed to collect basic data on the impact that search and rescue work has on the dog.

## ***Materials and Methods***

Twenty-two alpine rescue dogs underwent four different types of search activity with a duration of two times 20 minutes each and a 20 minute break in between the two cycles. During the summer season the impact of running along side a bicycle and a combined area and alpine rubble search was studied at 700 metres above sea-level. Ambient temperature was between 9° C and 26° C in summer. During winter,

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*Institute for Animal Welfare, Ethology and Animal Hygiene, Ludwig-Maximilians-University, Schwere-Reiter-Strasse 9; D-80797 Munich, Germany*

\*Corresponding author: [m.schneider@tierhyg.vetmed.uni-muenchen.de](mailto:m.schneider@tierhyg.vetmed.uni-muenchen.de)

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the impact of running with a person on skis (first part cross country uphill, second part down hill) and of an avalanche search were analyzed in an altitude of 2600 meters above sea-level and ambient temperatures between 3°C and -17°C. We compared physiological parameters of dogs during search and rescue and during running (without searching) to assess the impact of search and rescue work when compared to physical activity alone.

During all four types of work samples were obtained in a standardized fashion. The heart rate was recorded continuously over a period of 30 minutes before start of the activity until two hours after the activity ended, using measurement Accurex Plus devices by Polar®. Salivary cortisol samples were taken seven times: T0 = 10 minutes before start of the activity, T1 = immediate after first cycle of activity, T2 = after the 20 minute break in between the two cycles, T3 = immediate after second cycle of activity, T4 = 30 minutes after end of the second cycle of activity, T5 = 60 minutes after end of the second cycle of activity, T6 = 120 minutes after end of the second cycle of activity. Saliva samples were centrifuged immediately after sampling and then frozen at -20° C until they were measured by LIA (Lumineszenz Immuno Assay). Body temperature was measured six times (T0, T1, T2, T3, T5, T6). Venous blood parameters were determined prior to and immediately after the second activity cycle as well as two hours after the end of activity (T0, T3, T6). The blood parameters were analysed immediately after sampling. The following blood parameters were measured: blood gas pH, bicarbonate, blood gas pO<sub>2</sub>, blood gas pCO<sub>2</sub>, creatine kinase, plasma lactate, blood glucose, bounded urea nitrogen, creatinine, hematocrit, hemoglobin, alkaline phosphatase, alanine transaminase, total bilirubin, cholesterol, total protein, albumin, globulin.

## **Results**

Heart rate before start of the combined area and alpine rubble search, the avalanche search and running with a skier had mean rates of between 106.3 ± 16.6 bpm to 111.8 ± 20.0 bpm. The basic line heart rate before running along side a bicycle was significantly lower (mean value 91.2 ± 17.3 bpm; p≤0.05). Heart rate increased markedly during all four types of activity (p≤0.001). Heart rate during the two exercises in summer, the combined area and alpine rubble search and while running along side a bicycle increased to mean values of 164.4 ± 18.6 bpm to 170.0 ± 20.9 bpm. Heart rate during the two exercises in winter, avalanche search and running with a skier, increased to mean values of 168.9 ± 22.8 bpm to 176.0 ± 20.2 bpm. After all four types of activity heart rate returned to the basic values within 20–30 minutes following the end of the exercise. During the recovery period heart rate was significantly (p≤0.05) following the higher winter activities (running with a skier and avalanche search) when compared to the summer activities (running along side a bicycle and combined area and alpine rubble search).

Body temperature was measured six times prior to and after exercise. Mean

values of body temperature were prior to running along side a bicycle  $38.4 \pm 0.4^\circ \text{C}$ , combined area and alpine rubble search  $38.5 \pm 0.3^\circ \text{C}$ , running with a skier  $38.7 \pm 0.4^\circ \text{C}$  and avalanche search  $38.6 \pm 0.4^\circ \text{C}$ . After the combined area and alpine rubble search and running along side a bicycle body temperature rose to mean values of  $39.5 \pm 0.4^\circ \text{C}$  to  $39.7 \pm 0.6^\circ \text{C}$ . After the avalanche search and running with a skier body temperature rose to mean values of  $39.0 \pm 0.5^\circ \text{C}$ . Body temperature returned to base line within 20–60 minutes after the exercise ended.

Venous blood parameters were determined prior to and immediately after the second activity cycle as well as two hours after the end of exercise. Blood gas pH increased after exercise, reaching means of 7.40–7.43 (normal range: 7.30–7.40). In addition, there was a decrease in means of  $\text{pCO}_2$  to 30–31 mm Hg (normal range: 36–40 mm Hg) and in bicarbonate to 19–20 mmol/l (normal range: up to 24.2 mmol/l), whereas  $\text{pO}_2$  increased up to 58 mm Hg (normal range: 34–54 mm Hg). We saw an increase in creatine kinase activity after the activity with up to  $105.4 \pm 99.6 \text{ IU/l}$  after two hours following exercise. Plasma lactate concentration showed no major changes and never exceeded 2.1 mmol/l (normal range: 0.22–4.40 mmol/l). Blood glucose concentrations varied between  $5.4 \pm 0.4 \text{ mmol/l}$  and  $5.8 \pm 0.4 \text{ mmol/l}$  (normal range 3.9–6.7 mmol/l). Renal function (bounded urea nitrogen and creatinine), hematological parameters (hematocrit and hemoglobin), and hepatic parameters (alkaline phosphatase, alanine transaminase, total bilirubin and cholesterol) as well as the protein measured (total protein, albumin and globulin) did not change significantly under any of the four types of activity.

There was a delayed increase in the salivary cortisol concentration during the dogs' recovery period. Mean salivary cortisol values reached a maximum of  $5.3 \pm 4.2 \text{ nmol/l}$  in running along side a bicycle at T1, a maximum of  $3.1 \pm 3.2 \text{ nmol/l}$  in combined area and alpine rubble search at T2, a maximum of  $3.0 \pm 1.8 \text{ nmol/l}$  in running with a skier at T5 and  $3.4 \pm 2.0 \text{ nmol/l}$  at T5.

## **Discussion**

Heart rate, body temperature, blood gas parameters, blood glucose, creatine kinase and salivary cortisol showed signs of stress in dogs during search and rescue work. The results of the above-mentioned parameters (excluded creatine kinase) were similar to the results of Strasser et al. (1993) and Gazit and Terkel (2003), examining explosives and drug detection dogs. Creatinine kinase concentrations were much higher after the search work and running in this study when compared to drug detection dogs. This is an indicator of the more severe physical stress of locomotor activity during search and rescue work when compared to the searching work of explosives and drug detection dogs. Based on heart rate, body temperature, blood gas parameters, blood glucose and salivary cortisol values significant differences were found between the physical stress of search and rescue work in summer and the physical impact of avalanche search in winter. This difference may be due to the dif-

ference in altitude of the winter exercise area (2600 meters above sea level) when compared to training at 700 meters above sea level in the summer. In addition, different ambient temperatures between summer and winter affect the impact the work has on dogs. However, results did not indicate differences between the impact of search and rescue work when compared to exercise that consists of running alone.

## **Conclusion**

The results of this study show a definite stress in dogs during a two times 20 minutes search and rescue work. Nevertheless the two 20 minutes cycles of search work with a 20 minute break in between the two cycles can only be classified as a non-maximum stress for good trained rescue and search dogs. Also we found a marked difference in stress between a combined area and alpine rubble search in summer and an avalanche search in winter. The avalanche search in high altitude with cold ambient temperatures was a harder work for the search and rescue dogs than the combined area and alpine rubble search in summer. Therefore the resting periods after avalanche searches in high altitude must be longer than after combined area and alpine rubble searches, at least 20 minutes.

## **Acknowledgements**

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## **Keywords**

*avalanche, dog, rescue, searching, strain, stress*



# Lactium™: A New Anxiolytic Product from Milk

C. Beata\*, C. Lefranc<sup>1</sup>, D. Desor<sup>2</sup>

## Introduction

Birth and neonatal experiences trigger huge amount of stress for both mother and neonate. Obviously, the neonate is more vulnerable and for him stress can have dramatic effects. According to the situation, this stress can be considered as eustress or distress. If eustress is considered as a positive way to cope with the environment, then distress can be considered to result in pathological states such as anxiety. (Breazile 1987; Breazile 1988; Breazile, Vollmer and Rice 1988).

Scientists working in the field of neonatal studies have always been surprised by the post-feeding relaxation. This quiet sedation is not fully explained by the satisfaction triggered by the food; therefore researchers have tried to find a compound in the milk which could be responsible for the relaxing effect.

One starting point was the difference between the much more relaxing effect of the milk in newborns than in adults. This can be explained by the fundamental difference in the digestion of the milk between adults and neonates. Adults mainly use peptic hydrolysis whereas babies mainly use trypsin hydrolysis. Researchers then identified the biopeptide tryptic alpha-S1 caseine hydrolysate in bovine milk. This product has been patented under the name of Lactium™.

This product is a dairy ingredient. It has a GRAS (Generally Recognised As Safe) status and, as no chemical manipulation is necessary to obtain it, it is not considered as a drug but as a nutrient. Even though it comes from milk, it is a lactose free product and no allergy has been noted during trials.

Lactium™ was first tested in male Wistar rats (*Rattus norvegicus*). In this spe-

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\*CETACÉ 353 A Bd Grignan, 83000, Toulon, France

<sup>1</sup>INGREDIA S.A 51-53 Avenue F. Lobbedez 62033, Arras Cedex, France

<sup>2</sup>Laboratoire de Biologie et de Physiologie du Comportement. Faculté des sciences Nancy, France

\*Corresponding author: cbeata@noos.fr

cies, stress can be evaluated using the conditioned defensive burying paradigm (CDB) (Pinel and Treit 1978; Treit, Pinel and Fibiger 1981). Rats bury the electrode when they are under stress and using an anxiolytic product will prevent the rat from burying the electrode. In addition, the aggressiveness against the electrode can be evaluated. In a CDB paradigm in rats, Lactium™ has shown as much efficacy as the reference molecule, diazepam. Interestingly, no side effects were observed and no increase in aggression could be seen as can be the case with benzodiazepines.

As Lactium™ is not a drug but a nutrient some experiments have been conducted on humans using acute or chronic anxiety models. People volunteered to participate in these studies. It is interesting to note that Lactium™ has been tested on people before it has been tested on animals. Different trials have been conducted according to Good Clinical Practices (GCP) even though it was not a drug trial. Studies using the cold pressure test and the Stroop test; two old, but consistent, anxiety tests in human beings, have shown statistically significant effects and have allowed the assessment of efficacy of an interesting product in stress conditions. (Messaoudi et al. 2005). Also, with chronic stress, unpublished data (personal communication C. Lefranc) points out interesting considerations on the existence of high-anxiety profile populations and their interest in this product. Based on the results seen thus far, it was obvious to try this product with companion pets (e.g. dogs and cats) facing stressful conditions. Dogs seem likely to be the first target of this kind of product. Ambiguous hierarchical relationships, traps in inter-specific communication, anxious attachments and internal causes are some of the many reasons that anxiety can be triggered in dogs. Dogs can express anxiety in different patterns according to their breed and their history (Beata 1997). Cats are more territorial than social animals. Thus any modification in their living area puts them under stress and can lead to anxiety. But cats are not just a territorial animal, their development is also based upon attachment (Beata 2001) which allows them to tie affectionate bonds with their owners. Separation anxiety has been described in this species (Schwartz 2002). Agreeing or not with this, it is obvious that people adopt cats hoping for good relationships with them and their relatives. Social phobias (with the cat disappearing, the first moment when somebody else enters into the territory or exhibiting aggression or autonomic signs) are one of the main complaints of cats' owners.

### ***Subjects, Materials and Methods—Dog Trial***

One European, multicentric, GCP conducted, randomized, double-blind, placebo controlled trial was set up to evaluate Lactium's efficacy as an anxiolytic in dogs. Dogs were selected in specialist or general practices. The practitioner had to check that dogs were not subject to inadequate conditions of housing. Dogs that were considered to be anxious and therefore included in the study were those that met the criteria defined by Pageat in terms of pathological state and his EDED scale (Emotional Disorders Evaluation in Dogs) (Pageat 1995; Pageat 1998). Investigators

included anxious dogs with EDED score  $\geq 20$ . During the 28 day trial, dogs received either capsules of Lactium<sup>TM</sup> at 20mg/ kg/day or a placebo, both B.I.D.

At each step, EDED score was noted and the owner had to give a mark between 0 and 10 to evaluate the progress of the dog.

To classify the case as a success, dogs had to finish the trial with an EDED score  $<20$  and an owner evaluation mark  $\geq 6$  (on 10). Statistical analysis was conducted by the Behaviour Biology and Physiology Laboratory of the University of Sciences of Nancy.

## Results

Forty seven files fulfilled the requirements of the trial giving the following results:

	Lactium <sup>TM</sup>	placebo
successes	17	11
failures	5	14

This is statistically significant (Chi-square test, 1 d.f,  $p = 0.02$ ).

Many specific points have been studied all along this trial, according to the different categories of EDED scale.

The item “Sleep” shows a great improvement starting at day 7 (D7) ( $p = 0.05$ ) and is even better at D28 ( $p = 0.028$ ). A dog with an anxious sleep will awake many times during the night and will move. The item “Exploration – Scanning” also shows an excellent evolution with decrease of inhibition and attenuation of fear symptoms ( $p = 0.004$  at D28). Even the item “Aggression” shows a dramatic decrease from D7 ( $p = 0.02$ ) and keeps on improving at D28 ( $p = 0.006$ ). “Attachment” and “Self-Related Behaviours” (such as grooming) only show a tendency to improve. The association between success and treatment has been followed. For the Lactium<sup>TM</sup> group with successes, there was a significant correlation between decrease of EDED and evaluation mark ( $r = 0.644$ ,  $p < 0.05$ ). In an opposite way, for placebo group with control, there was no correlation between the decrease in EDED score and the evaluation mark ( $r = -0.31$ ;  $p$  N.S).

## Discussion

This first trial allows us to think that at the dose of 20 mg/kg, Lactium<sup>TM</sup> shows a good efficacy for relieving stress effects.

## Subjects, Materials and Methods—Cat trial

One European, multicentric, GCP conducted, randomized, double-blind, placebo controlled trial was set up to evaluate Lactium’s efficacy as an anxiolytic in cats.

Cats were selected from general or specialist practices. Investigators had to check that cats were not subject to inadequate conditions of living. To include cats, we used a personal scale, validated among the investigators who were all behavioural veterinary surgeons. They tested the scale in their own practices and agreed that the scale was robust but not very sensitive. This meant that we would not include normal animals but sometimes would miss slightly anxious cats. For example, we decided not to have an item on elimination and marking, thus we focused our selection on inter-specific relationships. Inclusion criteria was a score  $< 3$  on this scale but we could also include a cat if one of the five categories had a mark of 0. This signalled a very severe matter such as physical aggressions. Cats received over 56 days capsules of either Lactium™ at 15 mg/kg or placebo, both S.I.D. This study is still ongoing but preliminary results are available.

## Results

33 files have fulfilled the requirements of the trial at that time. They are evenly split between placebo (17) and Lactium™ (16).

	Lactium™	placebo
successes	9	4
failures	7	13

This is statistically significant (Chi-squared test, 1 d.f,  $p = 0.05$ ).

At day 0, there was no significant difference between the scores of the placebo group and the Lactium™ group. Neither was there a significant difference between the number of items scored 0 at day 0 (D0). We compared the scores, the number of items scored 0 and the evaluation mark using the Mann-Whitney U-test. The score at D0 is called V1S (V stands for Visit, 1 for the rank of the visit S for Score), and V3S at D56. The number of items scored 0 at D0 is called V1N0, and V3N0 at D56. Both V3S and V3N0 compared to V1S and V1N0, show a statistically significant difference between placebo group and Lactium™ group (respectively  $p = 0.01$  and  $p = 0.04$ ). Overall, evaluation is not statistically different but shows a tendency ( $p = 0.09$ ).

## Discussion

This product can help cats in social stressful conditions. Beside these fundamental statistical results, investigators have been impressed by owners' records. People saying "Oh my friend had never seen my cat. He was surprised to see him coming beside him on the sofa . . ." were not exceptional. Another very interesting point is that, for some cats, many months after the end of the treatment, the effect was always preserved.

## Conclusion

This new product seems to have many interesting effects. Its GRAS status and the fact that it is a nutriment opens a wide field of therapeutic indications with specific foods.

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## Keywords

*anxiety, cat, dog, Lactium, milk, stress*

# **Assessing Prolactinaemia in Anxious Dogs (*Canis familiaris*): Interest in Diagnostic Value and Use in the Selection of the Most Appropriate Psychotropic Drug**

***P. Pageat***

## ***Introduction***

Evaluating behaviour problems is a concern for many veterinary clinicians. Even if ethological methods provide possible ways to describe and measure behavioural manifestations, these techniques usually are too time consuming and are certainly not adapted to the versatility of clinical conditions. The lack of objective parameters can be regarded as one of the reasons for the slow development of clinical ethology in general veterinary practice. Many veterinarians are afraid of prescribing psychotropic drugs, because of the subjectivity of their evaluation of the patient and the risk of worsening or disinhibiting aggression in pets when treated with such drugs.

Thus, defining objective, reproducible and standardized parameters for the evaluation of patients appears to be the most effective way to improve the description of the behaviour and provide criteria to assist in choosing the most appropriate drug.

Because emotional reactions are one of the crucial elements contributing to the evolution of behaviour problems, measuring the blood level of some hormones or metabolites of catecholamines seems appropriate. Cortisol or its relatives have been some of the first parameters used to assess distress and emotional disorders (Gibbons 1964; Klemcke 1994). Unfortunately, this hormone is released in a pulsatile pattern (Ladewig 1987), showing significant variations during the day. In addition, it

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*Phérosynthèse Research Centre, Le Rieu Neuf, 84490 Saint Saturnin  
les Apt, France*

Corresponding author: pherosynthese@wanadoo.fr

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depends on the physiological and sexual, maturity status of the animals as well as the diurnal rhythm or nursing activity (Walker et al. 1992). Thus, measuring the cortisol rate through unique daily sampling does not provide significant information: clinicians have to obtain repeated samples to determine a baseline. Even if cortisol can be measured in urine, blood or faeces, obtaining multiple samples makes this parameter of little use in practice. Other hormones, thought to contribute to emotional reactions, like thyroid hormones have been studied too, but the dramatic individual and interindividual variations as well as the necessity to establish a baseline, make their use difficult, usually poorly predictive in the clinical setting and certainly impossible to use during follow-up.

Some experimental research has emphasized the pituitary hormones. Because they are directly under hypothalamic control, involving monoaminergic neurones, their variations are supposed to be more sensitive to any emotional modification. Several hormones have been and are still being studied. One of the first to be used was ACTH, given its relationships with the activating releasing-factor (CRF), the monoaminergic neurones involved in the control of CRF and emotional reactions (Landfield 1987, Kuroda et al. 1992, Bailly et al. 1993). As with cortisol, individual variations as well as practical problems (lack of specific monoclonal antibodies dedicated to canine ACTH or the necessity to preserve and send the samples at  $-18^{\circ}\text{C}$ ) made it difficult to validate this parameter in canine medicine. Some current studies in canine and equine behavioural medicine may help to modify this opinion and make ACTH one of the most promising parameters to assess emotional disorders in these species.

Between the pituitary hormones, prolactin (PRL) appears extremely interesting because of its inhibitory hypothalamic control. While the secretion of most of the other pituitary hormones is determined by the stimulating action of hypothalamic releasing-factors, the secretion of PRL is thought to be mainly mediated by the suppressive effects of dopamine (Ben-Jonathan 1985). This does not mean that direct stimulation of PRL secretion does not occur. Several substances like thyrotropin-releasing hormone (TRH), neurophysin, or substance P have been shown to stimulate its release (Kuan et al. 1990, Shin et al. 1995, Watanobe and Sasaki 1995). Especially known for its action on the mammary glands, prolactin is now regarded as a cytokine because of the structure of its receptors (Boutin et al. 1988, Kelly et al. 1993). As a cytokine, PRL has immuno-modulating action through receptors on the lymphocytes (Weigent 1996), but it also has receptors in the male sexual tract, plays a role as a trophic and protecting agent on the corpus luteum (Bazer et al. 1991) and is involved in growth, development, metabolism and salt-water balance (Nicoll 1980). When looking at the evolution of PRL in stressed animals, literature reports show that a variety of stressors increase the release of this hormone (Van de Kar et al. 1991). The PRL response to stress is characterized by a rapid increase reaching its maximum after 3 minutes and a slow decrease with a return to reference values reached after 60 minutes. In hyperemotional mice (Roman Low Avoidance), the

PRL blood level remains higher after stress than in hypoemotional ones (Roman High Avoidance) (Castanon 1992).

In dogs, the pharmacological treatment of anxiety-related behaviours uses psychotropic drugs which modify the activity of the monoamine neurones. The evolution of the available drugs reaches a level of specificity which induces the clinicians to try to find some consistent relationship between the symptoms of the patient and the pharmacological profile of the drug. In light of each patient, it is crucial to be able to choose between modifying DA, 5HT or NA transmission. Dopaminergic regulators like selegiline have been proposed in the treatment of anxiety-related disorders as well as 5HT-re uptake inhibitors (SSRI) like fluoxetine (Pageat 1998). Dopaminergic (DA) neurones are involved in emotional reactions (Tassin 1993). During acute stress, the DA neurones are activated and the amount of released dopamine increases. The situation seems to be more difficult to describe during chronic stress and especially in anxious patients. Controversial results have been published in humans and animal models (Thierry et al. 1976). In domestic species and especially in domestic dogs, little information is available (Reisner et al. 1996). The same is true for aggressive dogs and anxious dogs and cats (Osella et al. 2002), but all of them show a modification of the activity in DA neurones. Thus, assessing the PRL blood level in anxious dogs and trying to correlate it with their reaction to a treatment using an SSRI or selegiline may be a valid way to assess the validity of treatment with a particular drug.

## ***Materials and Methods***

This study is a prospective, clinical study, enrolling dogs presented for a behaviour consultation by their owners, and expressing clinical signs of distress confirmed by the use of the EDED scale (Pageat 1998). The inclusion criteria were the following: EDED score superior or equal to 10 (emotional disorder), no treatment using pheromones, psychotropic drugs nor hormonal treatment for the last 6 weeks, any breed, and any sex (neutered or entire). Before inclusion, females dogs were evaluated regarding their ovarian cycle had to be evaluated through physical and hormonal examination. Because of the influence of the temperature on the PRL rate, dogs leaving exclusively outdoors were not enrolled in the study. Before the final inclusion in the study the owners received complete information regarding the protocol and signed an agreement. Medical disease, whatever its nature, treatment with pheromone, psychotropic or hormonal products, were defined as cases of non-inclusion.

After inclusion, a randomization number was assigned to the dog, with a pre-defined treatment: fluoxetine (1mg/kg once a day) or selegiline (0.5 mg/kg once a day). Each dog was evaluated through a complete behaviour examination, a physical examination, the measure of the EDED scale.

The protocol for the evaluation of PRL rate was the following: first a blood sample was drawn and then an intramuscular injection of 250 µg of TRH (Stimu-



TSH® from Distriphar Inc.) was given. A second blood sample was obtained 90 min later. The blood was centrifugated and the plasma placed in a container with carbo-ice ( $-80^{\circ}\text{C}$ ). It was sent to the Laboratory of Endocrinology of the National Veterinary School of Nantes (France). The prolactinaemia was assayed using the EIA Kit Canine Prolactin® from Milenia (distributed in France by Beckman Coulter). The sensitivity of the detection was 0.4 ng/ml and the limitation value was 80 ng/ml. The inter-assay coefficients of variation were 5.5 to 9.2 percent, the intra-assay coefficients of variation were 6.0 to 7.4 percent and the spiking recovery percents were 92 to 109 percent. Taking in account the value of the standard deviation of the measures of EDED score and prolactinaemia, we have calculated the number of dogs necessary to obtain a significant difference between the two treatment-groups:  $N = 60$ .

At the end of the examination, the vet prescribed the treatment assigned by randomization (fluoxetine or selegiline). The dogs were re-evaluated 4 weeks later (day 26 to 30), 8 weeks later (day 54 to 58) and 16 weeks later (day 118 to 122). The follow-up visits were organised the same way as the inclusion visit, including EDED scoring and prolactinaemia.

## **Results**

A population of 84 dogs were enrolled in this study; 5 were excluded because they had shown medical conditions or died, during the follow-up (2 atopic dogs, 1 flea infestation, 1 bronchopneumonia and one dog died after a car crash). Of the dogs who were withdrawn due to death or medical disease, 3 in the selegiline group and 2 in the fluoxetine group.

The analysis of the correlations between prolactinaemia and EDED score show a positive significant correlation ( $p = 0.005$ ), prolactinaemia being significantly higher in the dog having the higher EDED score. The dogs with the high EDED scores ( $>20$ ) expressed clinical signs of generalized anxiety, when the dogs with normal values of prolactinaemia got an EDED score correlated with phobia or mild anxiety ( $10 < \text{EDED} < 20$ ).

Regarding the follow-up of the treatments, the statistical analysis show a positive correlation between improvement with selegiline treatment and dogs with hyperprolactinaemia ( $p < 0.001$ ) and a positive correlation between improvement with fluoxetine treatment and normoprolactinaemia ( $p = 0.01$ ). These correlations are significantly negative for the opposite association.

## **Conclusion**

Measuring prolactinaemia seems to be an effective, reproducible and objective way to evaluate dogs with emotional disorders. Prescribing drugs with an action on the DA neurones seems to be preferable and more effective in dogs showing a high prolactinaemia when it appears to be better to use an SSRI in the dogs with a normal

PRL rate. Because of the positive correlation which seems to exist between PRL rate and EDED score, it suggests that the disorganisation in the dopaminergic system could be higher in severe generalized anxiety. These results seem consistent with the preliminary results published in the studies measuring the peripheral blood level of DA and NA (Osella et al. 2002). Such results have to be emphasized by complementary studies, but the current results can be regarded as encouragement toward developing a biological approach to behaviour problems.

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## Keywords

*anxiety, behaviour, dog, measurement, prolactin*

# **A Retrospective Analysis of Relationships with Severity of Signs of Fear of Fireworks and Treatment Outcome in 99 Cases**

**M. Gandia Estellés<sup>1\*</sup>, D. S. Mills<sup>1</sup>, P. H. Coleshaw<sup>2</sup>,  
C. Shorthose<sup>3</sup>**

## **Introduction**

Although fear of fireworks is reportedly the most common sound phobia in dogs (*Canis familiaris*) occurring in 38 percent of referred cases (Gilbert 2003), little is known about their development and prognostic factors. Previously, Mills and colleagues (2003) in a retrospective analysis of firework fears in dogs examined the efficacy of medication, pheromone therapy and a desensitisation programme using a compact disk (CD) on the management of this problem. It appeared that cases using medication did not achieve the same level of improvement as those which did not use any drugs, although there was no evidence of a significant difference in the severity of these cases at first treatment. In addition, owners of these cases were significantly ( $p < 0.05$ ) less likely to report ignoring the dog's behaviour when it was fearful. Those using medication together with a CD desensitisation programme (Fear of Fireworks) were significantly less likely to ensure the dog was relaxed before the CD was started and less likely to use the recording daily than those who used the CD without medication. There was no significant difference reported in the tendency of these groups to reward the dog when it was relaxed during the playing

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<sup>1</sup>*Animal Behaviour, Cognition and Welfare Group, University of Lincoln, Dept of Biological Sciences, Riseholme Park, Lincoln, LN2 2LG, UK*

<sup>2</sup>*Blue House Veterinary Centre, 71a Congleton Rd, Biddulph, Staffs ST8 6EF, UK*

<sup>3</sup>*Cheshire Pet Medical Centre, Manor Lane, Holmes Chapel, Cheshire CW4 8AB, UK*

\*Corresponding author: mgandiae@yahoo.com

of the CD, the tendency to play the CD during a real firework display, their reported ability to find time to play the CD or apparent frequency of use of the CD. There was no significant difference between those that used medication and a pheromone treatment (DAP, Ceva Santé Animale) and those that did not use medication and DAP in the length of time that DAP was used. Thus it seemed that owners who used medication were less compliant with behaviour therapy instructions. Few other studies have reported on factors of potential prognostic value, although it is widely held, that more severe cases and longer standing cases have a poorer prognosis (e.g. Overall 2002). Also, it is widely assumed that noise fears tend to generalise from one sound to another with time, but no studies investigating the development of the problem in this way have been reported to the knowledge of the authors. Therefore the aim of the current study was to examine the validity of these perceptions using a larger data set (99 subjects).

### ***Aims and Methods***

Recruitment of subjects was as described previously (Mills et al. 2003) and the data set included subjects from the earlier analysis in addition to subjects recruited since this date using a similar postal return methodology. Each of 14 possible signs of fear was scored from zero–three based on its reported frequency (0 = never, 1 = seldom, 2 = often, 3 = always). Severity was determined in two ways. Firstly on the basis of the number of signs shown by a dog and secondly on the basis of a global severity score, which was calculated from the sum of the product of the frequency of each sign expressed. In some cases analysis using the actual severity scores was possible to determine correlations with other variables, whilst in other cases the population was divided into two subsets: those above and those below the median value for the population. Those whose score was at the median were excluded. Pearson correlations, regression analysis and Chi Squared tests could then be used to examine relationships, with a five percent threshold of significance adopted throughout for the evaluation of the significance of results.

### ***Results***

Dogs from six months to 13 years (median of six years) were represented, 45 percent of which reported a fear of fireworks since puppyhood. The duration of the problem ranged from 0.5 to 13 years with a median of four years. For those who could clearly identify an initial trigger of the problem, the reported incident which started the fear of fireworks was generally loud bangs or direct exposure to firework noises ( $n = 27$ ), although two were apparently related to an incident involving a car (one the slamming of a car door, the other a car accident) and two were believed to learn the problem from another dog in the home.

The median number of signs of fear shown by dogs in the population was

eight (range: 2 to 14, mean = 8.5); the median global severity score was 20 (range: 2 to 42, mean = 19.9).

Individuals with a longer standing problem were more likely to report a fear of additional noises in their dogs ( $P = 0.016$ ), but no significant correlations ( $P > 0.1$ ) between the duration of the problem and the global severity and absolute number of noises reported to evoke the fear response were found. There were also no significant relationships identified between the duration of the problem or being afraid of fireworks since puppyhood, and the tendency for the fear to generalise to similar noises. Generalisation was determined by consensus of the first two authors as to which noises shared similar characteristics.

Differences in the frequency of the 14 behaviour signs of fear before and after treatment correlated well ( $P < 0.001$ ) with owner satisfaction. However, there was no relationship between either measure of severity (i.e. global score or the number of signs of fear) and reported treatment success. However, owners of animals also afraid of thunder were associated with a higher level of treatment satisfaction ( $P < 0.01$ ). Frequency but not duration of playing of CD recordings as part of a structured desensitisation programme was correlated positively with the reported success.

## **Discussion**

These data appear to contradict the common anecdotal opinions widely published on the relationship between the severity, duration and treatment of fear of fireworks, i.e. this analysis suggests that the severity and duration of the problem are not predictors of the success of the treatment. This should encourage clinicians to advise owners that it is never too late to treat their pet and help relieve its distress in the longer term. The results also appear contrary to previous speculation that comorbidity between fear of fireworks and thunderstorms might carry a worse prognosis (Overall 2002), although differences in the typical severity of thunderstorms in the USA compared to the UK may limit the extrapolation of this claim between countries. The data further suggest that fear of fireworks does not routinely continually generalise to an increasing number of sounds with time, although there may be some limited increase in the number of noise fears with time. It is also worth noting that it would appear more important to advise clients to play desensitisation recordings frequently rather than for a long time in order to maximise treatment success. Our previous study (Mills et al. 2003) suggests that this is something which even less compliant owners are able to do.

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**Keywords**

*dog, fear, firework, noise, phobia, thunder*

# Use of a Cape (The Storm Defender<sup>®</sup>) in the Treatment of Canine (*Canis familiaris*) Thunderstorm Phobia

**N. Cottam\*, N. Dodman, T. Critzer**

## **Introduction**

Thunderstorm phobia is a common canine phobia, though no precise prevalence data exist (Overall, 2001). The Behavior Department in the Cummings School of Veterinary Medicine at Tufts University saw 19 cases of canine thunderstorm phobia (7 primary diagnosis, 12 secondary diagnosis) between April 2004 and April 2005, out of approximately 231 total cases. This constitutes 8% of total cases in a year. This figure could be higher in areas that have a longer thunderstorm season than that in the clinic's region, where thunderstorm season generally lasts for approximately 6 months (May to October).

Clinical signs of thunderstorm phobia include panting, pacing, hiding, shaking, dilation of the pupils, salivation, lack of appetite, owner-seeking behavior, attempts to escape confinement, and inappropriate elimination. Reports of the role of a breed predilection in the development phobias vary. One study reported no breed predilection (Voith and Borchelt, 1985), while another study found that herding breeds were overrepresented in a group of thunderstorm phobic dogs (McCobb et al. 2001). McCobb et al. (2001) reported the average age of onset is 0–1 years of age, which correlates with the age of a dog's first storm experience. Age of presentation for therapy has been reported to be between 1–5 years (Shull-Seleer and Stagg, 1991), which supports the idea that fears increase in intensity over time. This could result in a delay before the behavior is severe enough for the owner to seek treatment. The late age of presentation for treatment could also be related to the reported

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*Dept. of Clinical Sciences, Cummings School of Veterinary Medicine at Tufts University (CSVMTU), North Grafton, MA, 01536 USA*

\*Corresponding author: [Nicole.Cottam@tufts.edu](mailto:Nicole.Cottam@tufts.edu)

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overrepresentation of presumably older, shelter-adopted dogs in anxiety disorders (Voith and Borchelt, 1982).

Fear of storms is considered an adaptive evolutionary behavior, though the response of thunderstorm phobic dogs is excessive. The etiology of this problem is not known precisely. It has been postulated that phobic dogs have a predisposition to developing anxiety related conditions. This theory is supported by Overall's study (2001) which demonstrated a correlation between the presence of thunderstorm phobia and separation anxiety (Overall et al. 2001). Some theorize that storm phobia is essentially a thunder noise phobia (learned or innate) and that the dog becomes conditioned to fear other aspects of the storm including changes in illumination level, lightning, darkness, wind and noise. Unintentional reinforcement of a dog's fearful behavior could exacerbate the condition. Some dogs appear to detect storms before their owners, leading to the possibility that dogs can sense changes in the environment that their owners can not, such as changes in barometric pressure, ozone concentration or levels of static electricity.

Treatments for thunderstorm phobia include systematic desensitization, counterconditioning and medication. Thunderstorm phobia has been considered difficult to treat with desensitization due to the complexity of simulating the multiple sensory experiences involved in a thunderstorm. The clinical impression of the authors is that pharmacological intervention can be ineffective. The need for alternative therapeutic options for treatment of thunderstorm phobia is desirable. Both owner and dog can suffer remarkably from the consequences of this affliction, which can include mental and physical injury to the dog when it attempts to escape confinement, destruction of the owner's property and ultimate breakdown of the human-animal bond. This investigative project sought to determine whether a new cape, that is thought to reduce a dog's experience of static electricity, is effective in the treatment of thunderstorm phobia.

## ***Materials and Methods***

Systematic follow up was conducted with 24 owners of thunderstorm phobic dogs who contacted The Tufts University clinic between May 2004 and January 2005 for help with a behavior problem and were advised to try the 'Storm Defender.' This is a red cape which lies on the dog's back and is secured around its midsection and neck. The cape has a lightweight inner metallic lining that supposedly shields the dog from the potentially painful or fear-evoking effect of static electricity. The cape is fitted after the dog shows the first signs of anxiety so that the dog learns that wearing the cape results in relief.

A pre-anxiety score was generated for each dog, with a post-anxiety score after the owners have used the cape during 5 thunderstorms. The pre- and post-anxiety scores are based on the owner's report of twelve anxious behaviors demonstrated by their dog during a storm. The twelve anxious behaviors documented are: the inten-

sity of panting, shaking, attention-seeking behavior, whimpering or whining, salivation, attempt to escape, reduction of appetite, dilation of pupils, frequency of lack of bladder or bowel control, barking, and intensity and duration of pacing and hiding behaviors.

## **Results**

The preliminary results are encouraging. Ten of 14 owners contacted via telephone anecdotally reported that the cape had a moderate to great effect, while 4 reported no effect or a very mild effect. One owner reported that her dog approaches the cape, kept hung on a hook, and stares at it at when a storm is approaching. These results suggest that use of this cape might decrease storm-associated anxiety.

## **Future studies**

A further study will utilize a control group composed of dogs fit with a non-metallically lined cape, to test whether it is indeed the static-reducing quality of the cape that is responsible for its apparent effectiveness.

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## **Keywords**

*cape, dog, electric, fear, phobia, static, thunderstorm*

# Trends in Canine and Feline Behavioral Diagnoses: 1991–2001

***M. Bamberger\*, K. A. Houpt***

## ***Introduction***

Practitioners' awareness and owners' perceptions of behavioral problems may lead to changes over time in the numbers and types of cases seen by general practitioners and referred to major university centers. An understanding of these trends and knowledge of associations between diagnoses can make the behavioral consultation time much more efficient by allowing the practitioner to focus questions during history-taking, narrow down a differential and make the correct diagnosis.

Behavioral problems have been assessed by owner surveys (Adams and Clark 1989; Vacalopoulos and Anderson 1993; Heidenberger 1997; American Pet Products Manufacturers Association 1999–2000; Wells and Hepper 2000; Guy et al. 2001; Marder 2002; American Pet Products Manufacturers Association 2003–2004; Marder et al. 2004) and case-review studies (Borchelt 1983; Hart and Hart 1985; Knol 1987; Wright and Nesselrote 1987; Blackshaw 1988a, b; Olm and Houpt 1988; Landsberg 1991; Appleby et al. 1994–2003; Mertens and Dodman 1996a,b; Fatjo et al. 2002). Most behavioral studies do not evaluate trends over time. However, a few studies have reported monthly and seasonal trends in behavioral problems (Appleby et al. 1994–2003; Marder 2002) or have provided yearly data (Appleby et al. 1994–2003; American Pet Products Manufacturers Association 1999–2000; American Pet Products Manufacturers Association 2003–2004) with some analysis from year to year (American Pet Products Manufacturers Association 2003–2004). Results of a 60-item behavioral questionnaire given to owners of shelter dogs at 1 week, 1 month, 2 months, 3 months and 6 months post-adoption showed that

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*Department of Clinical Sciences, College of Veterinary Medicine,  
Cornell University, Ithaca, NY 14853 USA*

\*Corresponding author: [mjb57@cornell.edu](mailto:mjb57@cornell.edu)

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house soiling and vocalization both decreased over time, while stranger-directed aggression increased (Marder 2002). In a 1994 review of cases (Appleby et al. 1994–2003), seasonal trends were found in dominance, fear and territorial aggressions towards people, and rank order aggression between cohabitating male dogs; the 1996 review (Appleby et al. 1994–2003) suggested a similar seasonal trend in rank order aggression between dogs in the home. In the most recent survey by The American Pet Products Manufacturers Association, data from 2000 and 2002 were compared: no significant differences were found in any canine or feline behavioral problem (American Pet Products Manufacturers Association 2003–2004).

The aim of this study was to search for changes in the frequencies of canine and feline cases seen at the Animal Behavior Clinic at Cornell University from 1991 to 2001 inclusive, and to assess associations between two individual diagnoses within individual cases over the specified time period.

## **Methods**

Records for 1644 dogs and 736 cats were evaluated. Data used included species, breed, sex, consultation year, birth date, diagnoses and attending clinician. The SNO-MED Clinical Terms system served as the basis for diagnoses. Each case was allowed a maximum of three diagnoses. The following general diagnostic categories were used: aggression, anxieties, locomotive behaviors, ingestive behaviors, self-directed aggression, grooming behaviors, fears, house soiling, phobias, sexual behaviors, unruly behaviors, vocalization behaviors and miscellaneous behaviors. Diagnoses under the general category of aggression were grouped into subcategories depending upon the target of the aggression: people (owners and strangers), animals or things. Fears were also listed into categories by targets: fear of people, animals or situations. House soiling diagnoses were reported in either marking or elimination subcategories. For each species, each diagnosis was initially analyzed by determining its frequency over the total study period. Each diagnosis with an average of three or more cases per year over the study period was then evaluated for trends over time using least squares linear regression. Associations between diagnoses occurring within the same case were analyzed by selecting for all cases of the first diagnosis over the total study and then determining the number of cases of the second diagnosis occurring within the selected group of the first diagnosis. Standard software was used for all analyses (Statistix 2000). Values of  $p < 0.05$  were considered significant.

## **Results**

Evaluation of the canine data showed an upward trend overall as well as trends in the categories of aggression, anxieties, house soiling and unruly behavior. In the category of aggression, upward trends were seen in stranger-directed aggression as well as in fear aggression directed at strangers; a downward trend was noted in

dominance-related aggression. Upward trends were also noted in anxieties as well as in both general and separation anxiety. Downward trends were observed in house soiling as well as in elimination. An upward trend was observed in attention-seeking behavior. A majority of associations between canine diagnoses involved cases with both diagnoses from the aggression category. Evaluation of the feline data showed a downward trend overall but no trends in individual diagnoses. A majority of associations between feline diagnoses involved cases with both diagnoses from either the aggression or the house soiling categories.

## **Discussion**

Aggression is the most common behavioral problem seen in dogs in practice (Borchelt 1983; Knol 1987; Blackshaw 1988b; Landsberg 1991; Appleby et al. 1994–2003; Mertens and Dodman 1996a; Fatjo et al. 2002) with separation anxiety often listed as second (Knol 1987; Blackshaw 1988b; Appleby et al. 1994–2003). The results reported in this study confirm these findings. Cases of stranger-directed aggression, fear aggression directed at strangers, anxieties, general anxiety and separation anxiety increased over time, while dominance-related aggression, house soiling and elimination problems decreased. Only one other study has shown a similar increase in stranger-directed aggression, but was done over a much shorter period of time (Marder 2002). Associations among canine behavioral problems most often occur between aggression diagnoses (Borchelt 1983; Wright and Nesselrote 1987) but have also been reported between aggression and non-aggression diagnoses related to phobias and anxiety (Borchelt 1983) as well as between separation anxiety and phobias (Overall et al. 2001). Our results generally support these findings. The strongest associations were found in cases with fear aggression directed at owners that also had fear aggression directed at strangers, and in cases of fear aggression directed at owners accompanied by a diagnosis of dominance-related aggression.

A majority of the feline case studies (Hart and Hart 1985; Olm and Houpt 1988; Landsberg 1991; Mertens and Dodman 1996b) show that house soiling is the most common problem and aggression is secondary. Our study confirmed these results. Elimination problems and intercat aggression were the most common diagnoses in their categories. The strongest associations were found in cases of play aggression directed at owners accompanied by either attention-seeking behavior or dominance-related (status) aggression.

## **Conclusion**

Analysis of our data from 1991–2001 shows that trends over time exist overall in both canine and feline cases and in several canine behavioral diagnoses. Associations between several categories of diagnoses exist in both canine and feline cases.

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### **Keywords**

*associations, diagnosis, trends*

# **The Effect of an Additional Programme of Socialisation for Kittens (*Felis sylvestris*) in a Rescue Centre on Behaviour and Suitability as a Pet after Re-homing**

***R. A. Casey\*, J. W. S. Bradshaw***

## ***Introduction***

In recent years the numbers of cats kept as pets in the UK has surpassed the number of dogs: approximately 8 million cats were owned by 5 million households in the UK (PFMA 2000). Generally cats are considered popular pets because they offer affection and companionship, but are easier to care for than dogs (Zasloff and Kidd 1994). The personality of cats is obviously an important factor in their popularity: in most circumstances people seeking a pet prefer an affectionate cat (Archer 1997). In a study by Vandenbussche (2001), owners seeking a new cat from a rescue shelter were asked to complete a questionnaire about their selection criteria. The majority of respondents stated that their preference was for a sociable or cuddly cat (54%), with 16% stating they were looking for a playful cat, and only 5% of respondents stated that they wanted an 'independent' cat. The attachment of people does, however, appear to be a complex process and influenced by a number of factors. For example, although Serpell (1996) found an association between owner reported levels of attachment and pet behaviour, Bradshaw et al. (2001) found that owner reported levels of emotional support from their pet were highest in cats with more than 5 'problem' behaviours. However, the friendliness of adult cats towards humans does appear to be an important factor in the establishment of a strong owner-pet bond, and the retention of the pet by the owner.

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*Anthrozoology Institute, Department of Clinical Science, University of Bristol, Langford, Bristol. BS40 5DU, UK*

*\*Corresponding author: Rachel.Casey@bristol.ac.uk*

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Variability in friendliness towards humans in cats is influenced by not only by early experience and specific learning experiences throughout life, but also genetic influences (Mendl and Harcourt 2000). The importance of genetic effects on the behaviour of kittens was highlighted by Turner et al. (1986), and McCune (1992) reported that one year old socialised cats born from a friendly father approached people more readily than those from a more fearful father. These effects are consistent with those found in a range of other species in both domesticated and wild populations, and appear to represent a 'boldness-fearfulness continuum' (Sloan-Wilson et al. 1994). Underlying personality traits or 'behavioural styles' have also been identified in adult cats. Lowe and Bradshaw (2001) investigated personality traits amongst adult cats, and found four elements of behavioural style that were consistent over time (from 4 months to 2 years). These underlying personality types appear to have an effect on the different strategies that cats show in response to environmental stressors (Casey and Bradshaw 2005). Genetic influence on behaviour is also apparent in terms of differences in breed specific behaviours. For example, show judges were found to identify different traits in breeds of cats in a questionnaire survey (Hart and Hart 1984), and in a survey of owners of a range of different pedigree breeds and domestic short haired cats, Clarke (2002) found significant differences both in reported described behavioural traits and in the prevalence of problem behaviours.

As well as genetic influences, learning opportunities influence the behavioural characteristics of adults. Studies in a range of different species have suggested that plasticity to learning about environmental stimuli is more pronounced in some periods of development than others (Bateson 1979). Although current studies on domestic animals tend to suggest a single critical period early in life, it makes sense in evolutionary terms for the timing of this enhanced capacity for learning to vary with specific types of stimuli, such that different developmental periods may be more important for learning about different aspects of the animal's environment. Whether the critical period for learning is a single 'window', or a series of more specific opportunities for learning, the effect it has on later behaviour is profound: for example, Kuo (1930) found that kittens reared with rats become socialised to them, despite the fact that they are naturally a prey species for cats.

In a range of experiments, Karsh and Turner identified the time period during which kittens are most susceptible to learning specifically about social contact with people as between 2 and 7 weeks of age, and that increasing the period of time for handling from 15 to 40 minutes significantly increased the period of time kittens spent in close contact with testers at 14 weeks of age (Karsh and Turner 1988). Although authors have criticised the use of chronological measures of behavioural development in the dog (Webster 1997), there is likely to be a lesser degree of variability in developmental rate in cats as there is less diversity between breed types. The data on sensitive periods for learning in cats is therefore likely to be more widely applicable than is that for dogs. It has been well established that the range of

social stimuli experienced by a kitten during this 'socialisation period' is influential on social behaviour later in life (McCune 1995). Experience of specific stimuli, such as contact with a particular sex of handler, will specifically affect perception of people as adults (McCune 1995). Collard (1967) reported that kittens handled by 5 persons made fewer escape attempts to a stranger, unlike kittens that were handled by one person or not handled at all.

To enhance the socialisation of kittens, Seksel (1997) has suggested using socialisation classes, as for puppies, which she reports to be useful in nonspecifically improving later behaviour in adult cats. Kitten socialisation classes are not generally conducted in the UK, as most kittens are not homed until the end of the period generally accepted to be the critical period for learning in cats, and hence the onus for 'socialisation' rests more with the breeders.

There is, therefore, good evidence, that a varied experience during the 'socialisation period' in kittens is likely to add to the quality of the human-cat relationship later in the cat's life (McCune et al. 1995). There have not, however, been any studies investigating the effect of giving an additional programme of socialisation on the longer-term behaviour patterns of cats, or its effect on the owner-cat relationship.

It is commonly the situation that large numbers of kittens are either brought into rescue shelters at a young age, or are born within the shelter. Although their physical care in such centres is generally very good, the social and physical stimuli that they experience are inevitably different, and generally less variable, than that which kittens born in a domestic environment would experience. Close handling of individual kittens by a range of different people is also limited by constraints on staff time. Hence in many cases the experiences of kittens within shelters in terms of socialisation to people and habituation to household events may not be optimal. The study conducted by Bickett (2002) described below and this study were therefore developed to investigate the effect of a programme of additional socialisation for kittens in rescue centres on their behaviour over the period of time spent within the rescue shelter, and also as reported by owners up to one year after re-homing.

To start investigating the effect of additional socialisation on kittens in a shelter environment, Bickett (2002) conducted a study at the Cats Protection Shelter, Cardyke Farm, Glasgow, over a five-month period. Ninety kittens that were either born in the shelter or entered at less than four weeks of age were randomly assigned into either a control group or an 'additional socialisation' group. Each of these groups were further divided according to a score of friendliness of the mothers derived from a two minute observation in an open field test (Turner et al., 1986). Socialisation of kittens began at two weeks of age and continued until they were available for homing at 8 weeks of age. The additional socialisation developed from gentle handling for the first 2 weeks by male and female handlers, to a more prolonged period of handling and play between 4 and 8 weeks of age. During this period kittens were also exposed to other friendly adult cats, a friendly dog, unfamiliar adults both male and female, and children. Kittens in the unsocialised group were

only exposed to people during the daily routines of cleaning and feeding and they had no interactions with cats other than their littermates and mothers, or dogs.

Testing occurred at 4 and 8 weeks of age, and involved scan samples of the kittens' behaviour in an open field type test using a standard ethogram (UFAW 1995), the latency for kittens to approach the experimenter (McCune 1995), and a subjective assessment of 'friendliness' and 'boldness' developed from Feaver et al. (1986), on a five point scale. 56 kittens that were homed by 9 weeks of age were also followed up 8 weeks after they were homed using an owner questionnaire.

In this study, the kittens in the socialised group were significantly more likely to show more 'friendly' behaviours and less 'unfriendly' behaviours at the 8 week test in comparison to the 4 week test than the control group ( $p < 0.05$ ). Kittens in the control group showed significantly more unfriendly behaviours at the 8 week test than the 4 week test. Significant friendly behaviours included the categories explore, play, rub object and approach; unfriendly behaviour included the categories low body, hiss, escape, tail between legs and hide. Ratings of kitten 'friendliness' and 'boldness' at 8 weeks were also significantly different between the groups at 8 weeks ( $p < 0.05$ ) and at 17 weeks as rated by new owners ( $p < 0.05$ ).

## **Materials and Methods**

In this study the sample was made up of kittens that were either born in, or arrived prior to 2 weeks of age to, one of 11 participating re-homing centres. In each shelter litters of kittens were given a programme of additional socialisation (socialised group) in one half of the study period, and had the normal shelter routine in the other half (control group). The additional socialisation consisted of handling by at least four people, including one man and one child of under 10 years. Owners of two randomly selected kittens from each litter were contacted by telephone one year after re-homing. Owners were asked about patterns of behaviour of their cat, the presence of any behaviours perceived to be a 'problem', and were also asked to complete a previously validated scale of emotional support (ES) (Bradshaw and Limond 1997).

## **Results**

Eight shelters withdrew from the study due to infectious disease or staffing problems. Of the remainder, kittens were removed from the 'socialised group' that had received less than a total of four weeks of additional socialisation, and kittens were removed from the control group where special circumstances, such as illness, had led to additional handling. Four kittens were also lost from the study as owners were not contactable. Thirty-seven kittens remained, 20 in the control group, and 17 in the socialised group. Three kittens had not been retained by their owner at one year of age. A greater number of behaviours regarded as a problem were reported by owners of the control group, although the difference was not statistically significant

( $p = 0.52$ ). There was no significant difference between the groups in the incidence of individual problem behaviours, although when fear related behaviours were combined, these were significantly more likely to occur in the control group ( $p < 0.05$ ). The mean score for ES was also significantly lower in the owners of the control group as compared to the socialised group ( $p < 0.05$ ).

## Conclusions

This study highlights the importance of an adequate amount of socialisation within rescue and re-homing centres on the behaviour of cats, and the cat-owner relationship, even one year after re-homing.

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## Keywords

*cat, re-homing, rescue, socialisation*

# Evaluation of a Behavioral Assessment Questionnaire in Animal Shelters

S. A. Segurson<sup>\*1</sup>, J. A. Serpell<sup>2</sup>, B. L. Hart<sup>3</sup>

## Introduction

The objectives of this cross-sectional study were to evaluate a behavioral intake questionnaire in animal shelters for the presence of biased results and to characterize behavior problems of dogs relinquished to shelters.

## Materials and Methods

The Canine Behavioral Assessment and Research Questionnaire<sup>©</sup> was utilized to evaluate behavioral characteristics of dogs being relinquished to animal shelters. Owners relinquishing their dogs were alternately assigned to two groups. The questionnaires for each group were identical except for preamble design which reflected confidentiality or non-confidentiality. The non-confidential questionnaires were to be used in providing information for adoption. Data from confidential and non-confidential groups were compared; results of the confidential group were then compared to a population of client-owned dogs.

## Results and Discussion

Statistical analysis of the behavioral profiles in the confidential and non-confidential shelter groups revealed significant differences in two areas of problem behavior:

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<sup>1</sup>Center for Companion Animal Health, School of Veterinary Medicine  
University of California, Davis, 95616 USA

<sup>2</sup>Department of Clinical Studies, School of Veterinary Medicine University  
of Pennsylvania, Philadelphia, PA, 19104-6010 USA

<sup>3</sup>Behavior Service, Veterinary Medical Teaching Hospital University of  
California, Davis, 95616 USA

\*Corresponding author: sasegurson@ucdavis.edu

owner-directed aggression and stranger-directed fear. Confidentiality had no apparent effect on the reporting of other types of behavioral problems, including stranger-directed aggression, nonsocial fear, separation-related behavior, dog-directed aggression or fear, or attachment/attention-seeking behavior. A comparison of confidential shelter data to client-owned data revealed that significantly more dogs in the shelter group were reported to show evidence of owner-directed aggression, stranger-directed aggression, dog-directed aggression and/or fear, stranger-directed fear, nonsocial fear, and separation-related behaviors. These findings suggest that intake questionnaires may sometimes provide inaccurate information in a shelter setting, but that the information they provide may still be useful when evaluating behavior of relinquished dogs.

### ***Acknowledgements***

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### **Keywords**

*animal shelter, bias, dog, questionnaire, relinquishment*

# **Behavioural Testing for Dog (*Canis familiaris*) Behaviour and Owners' Management in Urban Contexts: A Preliminary Study**

**L. Notari<sup>1\*</sup>, M. Antoni<sup>2</sup>, B. Gallicchio<sup>3</sup>, A. Gazzano<sup>4</sup>**

## ***Introduction***

Having a means to identify individual dogs that are potentially dangerous in outdoor contexts is very important in order to prevent risky situations in public places. This test was studied to identify dogs with potentially dangerous reactions to different outdoor stimuli and the management skills of their owners.

On the basis of previous temperament and behavioural tests and of evaluations of dog behaviour reported in the literature (Scott 1976, Broom 1988, Bateson 1991, Abrantes 1997, Netto 1997, Planta 2001, Svartberg 2002, Kubinyi 2003), a three-step test was developed. The dogs were tested in three different contexts—tied without walking, walking on leash and walking off leash—in order to maximise the similarity between test environment and real outdoor situations.

## ***Materials and Methods***

The study was carried out with 80 dogs and their owners. The test set was arranged outdoors in a fenced area and along a stretch of a public road.

In step one the dog was held on a lead by the owner and, for safety reasons,

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<sup>1</sup>*Via Donatello, 6 CAP 21100 Varese Italy*

<sup>2</sup>*Via Traversa Fontana 8 55045 Pietrasanta (Lucca) Italy*

<sup>3</sup>*Via Zuretti 2A 20125 Milano Italy*

<sup>4</sup>*Dip.to di Anatomia, Biochimica e Fisiologia Veterinaria Università di Pisa Viale delle Piagge 2 56124 PISA Italy*

\*Corresponding author: [lorellanotari@spazioaperto.net](mailto:lorellanotari@spazioaperto.net)



tied to a fixed pole. In the second step the owner along a short stretch of a public road walked the dog on a lead. In the third step the dog was left free in a fenced area. In each step a variety of stimuli were presented and veterinary behaviourists evaluated dog responses. Aggressivity, fearful reactions, reactivity/excitability, tendency to return to a calm state and owner management was assessed using a three-point scale.

Veterinary behaviourists made the evaluations of dog behaviour and owner management and trained stooge people prepared though courses held by behaviourists.

Stooge persons were trained in order to be able to interpret dog posture and expressions in order to minimize the risks of being bitten and to be able to give further information to the evaluators.

A veterinary behaviourist carried out behavioural consultations at the end of the tests. The veterinarian who carried out the behavioural consultations did not witness the tests. The test results were compared with the results of behavioural consultations.

## **Results**

All subtests demonstrated high reliability (Alfa Cronbach  $\geq 0.70$ ) and unidimensionality with value over 20%, which allowed an adequate measurement of the latent variable. The comparison between test results and behavioural consultation results showed a significant relationship to the behavioural history. It was found that differences of the Global score between groups of dogs considered to be low, average and highly dangerous during the behaviour visit was statistically significant (Bonferroni t-test). The significance of Low vs. Average dangerous dogs was  $p < 0.05$ , of Average vs. High dangerous dogs was  $p < 0.05$  and of Low vs. High dangerous dogs was  $p < 0.05$ . (Stanton 1988, Petrie 1999)

## **Conclusion and Discussion**

On the basis of these preliminary results the test might be considered a useful instrument for the assessment of potentially dangerous dogs in outdoor contexts. A better reliability of these tests can be reached pairing, as assessment tools, behavioural tests and behavioural visits. This procedure is strongly recommended by the authors because pairing field-testing and behavioural evaluation enables the evaluators to minimise the risk of having false negative results.

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### **Keywords**

*behaviour, dangerous, dog, test*

# Grief Following Death of a Companion Animal

**L. L. McV. Messam<sup>1</sup>, R. L. Zasloff<sup>2</sup>, B. Mader-Weidner<sup>1</sup>,  
T. Hendrie<sup>3</sup>, L. A. Hart<sup>1\*</sup>**

## **Introduction**

During a person's experience with a companion animal, the depth of attachment grows, deepening the experience of loss when the animal dies. In a classic study, clients involved in longer term relationships with animals that died were more likely to request a supportive session with a social worker than those not so involved (Quackenbush and Glickman 1984). The degree of attachment, sudden death of the pet, and living alone are reported to be related to the extent of grief for the caregiver (Archer and Winchester 1994). Some studies suggest clients experience less grief when electing euthanasia for seriously ill pets (Adams et al. 2000; McCutcheon and Fleming 2001; Planchon et al. 2002). This would support the perspective that since euthanasia allows the caregiver to be present when a companion animal dies, to support the animal at this time, to assure that death is peaceful, and to say good-bye at that moment (Lagoni and Butler 1994), it leads to less grief. While this perspective seems logical, the opposite has also been reported (Davis et al. 2003).

In an effort to understand the duration of grief in the most emotionally upset pet owners, we retrospectively surveyed individuals who had contacted a pet loss support hotline and examined the duration of time it took for these highly attached people to recover from the animal's death, as described in self-reports. We also sought to identify variables significantly related to the phenomenon of recovery itself.

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<sup>1</sup> School of Veterinary Medicine, UC Center for Animal Alternatives,  
University of California, Davis, Davis, CA 95616, USA

<sup>2</sup> 2200 Ross Drive, Auburn, CA 95616, USA

<sup>3</sup> Rio Linda Veterinary Clinic, 432 M St., Rio Linda, CA 95673 USA

\*Corresponding author: lahart@ucdavis.edu

## **Methods**

Participants in the study were drawn from those who had called the Pet Loss Support Hotline at the UC Davis School of Veterinary Medicine and were sent a questionnaire. The participants included only those who had elected euthanasia for their animals that were seriously ill. Questions concerned their pet's illness, their feelings about the illness, how they dealt with the experience, and the time that had transpired since the death of the pet. They were also asked about whether the person had accepted the death of the animal, and, if so, the elapsed time to accepting the death. Data on 82 participants included the 56 who had reached acceptance. The statistical analyses accommodated for those who had not reached acceptance.

Three types of analyses were performed.

1. In a non-parametric survival analysis, SAS version 6.12 was used to generate a survival function and curve based on the Kaplan Meyer formula.
2. In a parametric survival analysis, a log-normal model was assumed to describe how the rate of recovering from the death of the pet varied with time for different individuals. This allowed for the identification of particular covariates associated with the time to recovery (acceptance) from pet loss. The statistical analyses drew on 14 fixed covariates to identify which factors were of the most importance in determining the duration of time the owners took to accept the loss of their pet following elective euthanasia.
3. In a logistic regression using SAS version 8.1, the outcome in question was the dichotomous event of recovery from the loss or not, examining the variables that influenced people to recover from the loss of their animal, and whether or not they recovered.

## **Results and Discussion**

From the non-parametric survival analysis of 82 participants, 10 percent of pet owners had accepted the death of their pets by the end of three months, and 25 percent had accepted the loss by 12 months. By 19 months, 50 percent had accepted the loss, and by six years, 75 percent had accepted the loss. The protracted period of grief in our study, while consistent with the overall results of another study showing that after one year 22 percent were still grieving the loss of a pet dog or cat (Wrobel and Dye 2003), reveals that in highly attached caregivers, 50 percent were still grieving after one year.

From the parametric survival analysis, among the 14 covariates, gender and living arrangements had significant predictive value. For women, the median time

to recovery exceeded a year, and was not appreciably affected by living status. Men living alone had a median time to recovery of 3.5 months. However, men not living alone had a median time to recovery of about three years. The finding that for men living with others, the recovery period was tenfold longer than for men living alone seems counterintuitive. One explanation is that the men living with others received inadequate support in their grieving and felt isolated. It is documented that the lack of conventional rituals or practices for processing grief over the death of a pet can impair the resolution of grief; this problem is magnified if friends and family provide little sympathy and support to bereaved owners (Morales 1997). If the expression of grief and the enactment of mourning rituals are discouraged, the grieving person may be getting the message that the relations are not meaningful and the losses not significant. This problem, in which the person suffers a significant loss, but has no socially legitimized channel through which to express grief, is termed disenfranchised bereavement (Stewart et al. 1989).

Finally, in our logistic regression analyses, it was found that the years of education were strongly and significantly associated with a shorter duration of grieving. While visiting the pet's veterinarian for chronic illness prior to the death was associated with a shorter grieving period, the duration of time actively caring for the ill animal was associated with a longer period of grieving.

## **Conclusion**

In conclusion, we note that the veterinary profession has acknowledged the significance of grief over loss of beloved pets and offers suggestions for dealing with it (AVMA Committee on the Human-Animal Bond 1995). Abundant resources are available for families and professionals (Hart et al. 1990; Mader and Hart 1992; Anderson 2005), and listings are online for counsellors (Association for Pet Loss and Bereavement 2005). Nonetheless, veterinarians commonly underestimate the consequences of pet loss for clients (Catanzaro 1988, Gagnon and Salomon 2001), even though they regretted euthanizing a pet and had "felt guilty" after euthanizing a pet (Fogle and Abrahamson 1990). The results of our study reveal that veterinarians are well-advised to acknowledge an attached person's continuing grief for a companion animal's death, even after a year has passed. In this light, the variables affecting the duration of grieving, such as whether or not euthanasia is elected, duration of time caring for a sick pet, educational level, and, possibly, lack of support from family members (men), allow veterinarians to better predict which clients are likely to experience severe grief and to offer emotional support as appropriate.

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**Keywords**

*companion animal, death, grief, loss, pet, recovery*

# **Comprehension, Compliance, Outcome and Satisfaction: A Retrospective Survey of 49 Clients with Dogs (*Canis familiaris*) Treated for Behavior Problems**

***D. Frank*<sup>\*1</sup>, *J. M. O'Connor*<sup>2</sup>**

## ***Introduction***

Publications on behavior disorders in domestic dogs offer many similar recommendations for behavior modification (Landsberg et al. 2003; Overall 1997; Podberscek et al. 1999) though few examine the actual efficacy of these recommendations. Common treatment protocols include avoidance of provocative situations, having the pet sit prior to all interactions with people, and sit-stay or relaxation exercises. (Landsberg et al. 2003; Overall 1997)

Between January 1, 2000 and December 31, 2000, 214 clients presented their dogs to the behavior service at the Veterinary Hospital of the University of Pennsylvania for an initial appointment and treatment for a variety of behavior disorders. Demographic information was collected on 203 clients. Forty-nine (24%) of these were chosen randomly for participation in a survey. The objectives for this survey were to assess client understanding of the goals for treatment recommendation, compliance with the treatment plan, outcome relative to following the recommendation and satisfaction with the behavior consultation service.

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<sup>1</sup> *Department of Clinical Sciences, Faculté de Médecine Vétérinaire, Université de Montréal, St-Hyacinthe, QC, J2S 7C6 Canada*

<sup>2</sup> *Matthew J Ryan Veterinary Hospital, University of Pennsylvania, Philadelphia, PA 19104 USA*

Corresponding author: [diane.frank@umontreal.ca](mailto:diane.frank@umontreal.ca)



## ***Materials and Methods***

Demographic compilations were obtained from hospital electronic data records and patient files. The five handouts most frequently given to clients to explain treatment recommendations for social behavior, relaxation exercises, fearful behavior, fear aggression, and separation anxiety were used to develop the survey questionnaire (Overall, 1997). Clients were questioned only on topics relative to the handouts given at their appointment and about their opinion of the consultation. The survey questionnaire used for the assessment of comprehension, compliance, outcome, and satisfaction was developed with the assistance of a statistician. The survey was conducted by telephone at four to 16 months post-appointment by one veterinary student. The student was absent during the actual consultation and was given only the client's name, contact information, patient signalment and list of handouts presented to the client at the time of the appointment.

## ***Results***

Results of the survey indicated that although clients understood the rationale behind the treatment recommendations, they did not consistently follow the recommendations. While most clients reported less than great improvement in the problem behavior, overwhelmingly they were pleased with the consultation and kept the patient in their homes.

## ***Discussion***

The survey was conducted retrospectively with some clients contacted as early as four months post-appointment and others as long as 16 months later. The authors acknowledge that the recollections of the latter group may not be as accurate as the former.

## ***Conclusion***

In conclusion, treatment recommendations have historically focused on modifying the patient's behavior. The preliminary information obtained by this survey indicates that perhaps changing the pet's behavior is not the ultimate goal to reach. Some owners may just want to understand their pet's behavior, not necessarily change it. Similar results yielded by further investigation may indicate the need for treatment plans that emphasize client education and recommendations that focus on safety and management of the patient rather than modification of the problem behaviors.

## ***Acknowledgments***

The authors would like to express their gratitude to the following individuals for their perseverance, wisdom, and support: Dr. Erika Krick, Alison Seward, and Dr. Ilana Reisner.

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**Keywords**

*behavior, compliance, dog, owner, satisfaction*

# Effect of Telephone Follow-Up on Client Compliance in the Treatment of Canine Aggression

J. R. Lane<sup>1,2\*</sup>, L. M. Bohon<sup>2</sup>

## Introduction

The purposes of this experiment were to establish a baseline for client compliance in the treatment of dog aggression at a veterinary behavior specialty clinic, to identify barriers to compliance, to determine if telephone follow-up improves compliance, and to see if compliance correlates with owners' assessments of treatment effectiveness. Various exploratory analyses were conducted as well.

## Materials and Methods

Data were collected from the owners of 56 dogs recruited from the Behavior Service at the University of California Veterinary Medical Teaching Hospital in Davis, California. Each dog was randomly assigned to one of three treatment groups. Participants in the first treatment group received follow-up calls one, two, three, four, eight, and twelve weeks after their initial consultation. Participants in the second group received follow-up calls four, eight, and twelve weeks after their initial session. Lastly, participants in the third group received one follow-up call twelve weeks after their initial meeting.

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<sup>1</sup>*School of Veterinary Medicine, University of California, Davis, CA 95616, USA*

<sup>2</sup>*Department of Psychology, California State University, Sacramento, CA 95819, USA*

\*Corresponding author: [mimigardenia@sbcglobal.net](mailto:mimigardenia@sbcglobal.net)

## **Results**

Results indicated that the baseline for client compliance was approximately 60 percent. Barriers blamed for compliance problems were categorized as follows: mental (attitudes, beliefs, or emotions that interfere with compliance), management (environmental or organizational pressures that make compliance difficult), time (lack of time or being too busy), other, and none. An analysis of variance reflected that telephone follow-up increased compliance for some types of treatment recommendations, but not all. Treatment effectiveness did not correlate with client compliance rates. Dogs obtained for free were more likely to be removed from the study because they were euthanized than dogs that were purchased.

## **Acknowledgements**

I would like to thank George Parrott for statistical guidance and Hill's Pet Nutrition for their generous support.

## **Keywords**

*aggression, client, compliance, dog, efficacy, follow-up*

# **Are We Dog's Best Friend? Predicting Canine Cortisol Response from Human Affiliative and Punitive Behaviors**

**A. C. Jones\*, R. A. Josephs**

## ***Introduction***

Despite both the frequency of social interaction between humans and non-human animals and the large body of research investigating the relationship between hormones, social behaviour and health, virtually no research attention has been devoted to investigating how hormone levels influence, and in turn are influenced by, these cross-species interactions. This question is important for practical and theoretical reasons. Some hormones, and in particular the stress-marking hormone cortisol, have negative effects on physical health (Sapolsky 1992). Further understanding of the causes of elevated cortisol levels could allow us to avoid this elevation and thus minimize its negative impact on physical health. This question is also of great theoretical importance because it both fits into and broadly extends existing theoretical framework about the relationship between hormones on behaviour. Investigations of numerous species, ranging from cichlid fish (Oliveira et al. 1996; Oliveira et al. 2001) to humans (Bernhardt et al. 1998; Mazur and Booth 1998), have shown that competition with conspecifics and observation of competition between conspecifics can affect hormone levels. Social situations, including the presence or absence of social support, may lessen or enhance these hormonal effects (Stoney et al. 2000; Vedhara et al. 2000; Ruis et al. 2001; DeVries et al. 2003; Heinrichs et al. 2003; Kaiser et al. 2003; Rosal et al. 2004). Other individuals' behaviors, such as active support or avoidance, appear to act as mechanisms for transmitting and shaping changes in hormone levels.

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*The University of Texas at Austin, Department of Psychology, 1 University Station A8000; Austin, TX 78712-0187 USA*

\*Corresponding author: [acjones@mail.utexas.edu](mailto:acjones@mail.utexas.edu)

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We examined the influence of social interaction between dog (*Canis familiaris*) and handler on the dog's stress level, as marked by salivary cortisol, before and after an agility competition. We hypothesized that affiliating behaviours, including play and petting, directed from handlers towards their dogs after competition would dampen the dogs' increase in stress, and thus depress increases in cortisol. Punitive behaviours, including yelling and physical pushing, would have the reverse effect.

### **Materials and Methods**

A total of 184 handler/dog pairs competing in a North American Dog Agility Council sanctioned competition volunteered to take part in this study. Hormone levels were measured through immunoassay of salivary samples taken from the dogs an hour and a half (mean = 94 minutes; s.d. = 3.993) before they competed and again approximately 20 minutes (mean = 20.51 minutes; s.d. = 2.886) after results of the competition were announced. All salivary samples were taken between 1200h and 1500h to control for diurnal variation in hormone levels. At both times of sampling, canine salivary samples were collected by having dogs chew on sterile polypropylene gauze. These saliva samples were sealed and frozen immediately after sampling to avoid degradation of the contained hormones and to precipitate mucins.

Three trained researchers coded video clips of the handlers' behaviours towards their dogs for the two minutes immediately post-competition, recording how many seconds each handler performed each of 15 behaviours (inter-rater reliability = 90.2%). Those affiliating and punitive behaviours hypothesized to have significant effects on dogs' cortisol levels were examined. Affiliating behaviours were play (e.g., tug-of-war, chase), and petting of the areas around the ears, neck, and chin. Punitive behaviours were yelling and physical pushing that was clearly not in play.

### **Results**

As expected, affiliating and punitive behaviours were significantly negatively correlated ( $r = -0.196$ ;  $p = 0.008$ ), indicating that handlers who engage in one type of behaviour tend not to engage in the other. Through a regression, total time spent in affiliating and punitive behaviours was found to be a significant predictor ( $F = 39.919$ ;  $p < 0.001$ ; d.f. = 183) of dogs' change in cortisol from before to after competition. Affiliating behaviours are associated with a lesser increase in dogs' cortisol levels (beta weight =  $-0.131$ ); punitive behaviours are associated with a greater increase in dogs' cortisol levels (beta weight =  $0.119$ ).

### **Discussion and Conclusions**

Here we have begun to investigate the hormonal impact of affiliative and punitive social behaviours emanating from human handlers towards their dogs, and how

these behaviours can serve to either dampen or exacerbate a dog's stress response. These analyses have been conducted without regard to the particular dog's and person's general reactivity, personality, or health. Nonetheless, in the context of what may be an already highly stressful environment, an athletic competition, these affiliative and punitive behaviours are shown to have a significant impact on a dog's cortisol response. It is perhaps most remarkable that social affiliation served to dampen the dog's cortisol elevation, despite the combined stressors of physical exertion and competitive environments.

The current study shows that a possible means of reducing cortisol levels in dogs is through socially affiliative behaviours. Given the frequency of dog-person interactions, some people's dependence on dogs, and our society's professed love of dogs, minimizing these negative effects is a high priority. A dog who suffers frequently elevated cortisol levels may suffer the associated illnesses, including cognitive degradations that may affect their ability to serve in relatively high-stress roles (e.g., assistance dogs) and physical illness that shorten their life span.

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**Keywords**

*affiliation, cortisol, dog, social interaction*



# Effect of Fluoxetine Hydrochloride in Treating Canine Compulsive Disorder

M. Irimajiri<sup>1\*</sup>, A. U. Luescher<sup>2</sup>

## Introduction

Fluoxetine, a selective serotonin reuptake inhibitor (SSRI), is one of the pharmacological treatment choices that is effective for obsessive-compulsive disorder (OCD) in humans; it is widely used with behavioral therapy (Flament and Bisserbe 1997; Liebowitz et al. 2002). The phenomenological similarities of canine acral lick dermatitis (ALD) and human OCD have led to several clinical trials to test the efficacy of clomipramine (Goldberger and Rapoport 1991; Rapoport et al. 1992; Hewson et al. 1998) and fluoxetine (Wynchank and Berk 1998, 1998) for treating canine ALD. These clinical trials with serotonergic agents have indicated therapeutic profiles of human OCD and canine ALD are similar. However, efficacy of SSRIs for other compulsive disorder (CD) categories has not been tested. We conducted a double blind placebo controlled parallel-arm clinical trial study with fluoxetine to evaluate its efficacy for treating canine CDs.

## Materials and Methods

Sixty-two CD dogs (*Canis familiaris*) were randomly assigned to fluoxetine or placebo group. Each dog went through two weeks of pre-medication and six weeks of medication. The owner of the dog maintained a diary for eight weeks (pre- and during

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<sup>1</sup>University of Georgia College of Veterinary Medicine Department of Anatomy and Radiology, Athens, GA 30602

<sup>2</sup>Department of Veterinary Clinical Sciences, Purdue University School of Veterinary Medicine, West Lafayette, IN 47907 USA

\*Corresponding author: mamii@vet.uga.edu

medication period) and reported any adverse experiences. The severity of the behavior was measured by calling the owner every two weeks using a five point Likert scale (absent, mild, moderate, severe, very severe) (Hewson et al. 1998). Chi-square analysis was used for statistical analysis.

## **Results and Discussion**

After six weeks of treatment, the fluoxetine group was significantly better compared to the placebo ( $p < 0.05$ ).

The most common adverse events were lethargy and decreased/loss of appetite. However, all observed events were mild allowing all dogs to continue their medication and complete the study.

We concluded that fluoxetine is an effective and safe medication to treat canine CD.

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**Keywords**

*compulsive disorder, dog, fluoxetine, stereotypy*

# **The Effects of Queen (*Felis sylvestris*)-Rearing versus Hand-Rearing on Feline Aggression and Other Problematic Behaviors**

***E. Chon***

## ***Introduction***

With the increasing popularity of hand-rearing kittens, more attention has been given to the social behavior of cats. The goals of this study were: to determine if behavioral differences exist between queen-weaned and hand-reared cats towards both humans and conspecifics; and to determine any factors that affect the incidence of behavior problems in hand- and queen-reared cats.

## ***Subjects and Methods***

Sixty-seven cats from a program to rescue and hand-rear cats managed by veterinary students were in the treatment group, and 58 cats from a local animal shelter were in the control group based on their weaning history. Owners of both groups were called twice when the cats were ages 6 months and 1 year for a structured telephone interview.

## ***Results and Discussion***

Hand-reared cats were no more likely to display human- and conspecific-directed aggression and fear, and no more likely to develop behavior problems, than queen-reared kittens. In this study, weaning history did not appear to influence the frequency of problem behaviors, such as pica, excessive self-licking, and inappropriate elimination. However, the presence of another cat in the household and the use of a

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*School of Veterinary Medicine, University of California, Davis CA,  
95616 USA*

Corresponding author: [emchon@ucdavis.edu](mailto:emchon@ucdavis.edu)

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wand-type toy were shown to decrease the likelihood of aggression towards people. Hand-reared cats were scored to be significantly friendlier to people; and of all the cats that spent 100% of their time indoors, the ones that were hand-reared were rated to be significantly friendlier to cats than those that were raised by their queen.

**Keywords**

*aggression, cat, development, rearing, socialisation, toy*

# **Separation Anxiety: A Summary of Some of the Characteristics of 61 Cases Seen at a Sydney, Australia Behaviour Practice**

**G. Perry\*, K. Seksel, L. Beer, L. Batt**

## ***Introduction***

Separation anxiety has been defined as a condition in which animals exhibit symptoms of anxiety or excessive distress when they are left alone (Overall 1997). Behaviours commonly exhibited by dogs with this condition include destructiveness, excessive vocalisation, escape from home, and inappropriate elimination. Dogs that escape often seek the company of other humans. Many signs have been described—they may include drooling, panting, pacing and shaking.

The name “separation anxiety” is now in common usage, and any dog exhibiting one or more of these behaviours may be described as exhibiting separation anxiety by their owners, trainers and veterinarians.

There is a generally held belief that dogs exhibiting separation anxiety often come from shelters. An internet search found articles on pages of the American Rottweiler Club, the Michigan Humane Society, the Progressive Animal Welfare Society and several others which all state that abandoned dogs and/or shelter dogs are more likely to develop this behaviour. These dogs usually have a history of being abandoned during some time in their lives. They are dogs that either came from the shelter or dogs that are constantly in contact with people. The trauma of going to a shelter will predispose dogs to becoming over attached to humans

The aim of this study was to examine data on 61 dogs that had been diagnosed with separation anxiety at the Sydney Animal Behaviour Service, Australia, between 1999 and 2004, and to compare this with national data on dog ownership.

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*Sydney Animal Behaviour Service, 55 Ethel St, Seaforth NSW Australia*

\*Corresponding author: sabs@sabs.com.au

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## **Materials and Methods**

Information on all cases was entered into a spreadsheet under headings which included breed, sex, neuter status and source. Owner characteristics included number of people in the household and the time they are away from home during the week.

For this paper, descriptive data is compared to that of the National People and Pets Survey, conducted by McHarg et al. (1995).

## **Results**

Most of the dogs diagnosed with separation anxiety at this practice were purebreds (79%,  $n = 48$ ). This result is similar to that obtained for cases presented for aggression, where 76 percent were purebreds (Sydney Animal Behaviour Service data, 2005).

Males and female dogs were equally represented (31 males, 30 females) and four dogs (three males and one female) were entire. A range of breeds and sizes was represented, with 22 (36%) dogs being large breeds.

Thirty-seven (61%) of the dogs had been acquired from breeders, four (7%) from friends, six (10%) from pet shops and nine (15%) from shelters or rescue organisations.

When the number of people in the household was examined, it was found that 10 dogs (16%) lived in a single person household, 30 (49%) lived with two people and 21 (34%) with three people or more. Of the couples in this survey of data 85 percent were away from home daily for eight hours or more with many reporting absences of 12 hours. By contrast, those households containing three or more people were more likely to report short or variable times of absence.

Thirty five of the dogs in the study (57%) lived with one or more other dogs, while 15 (25%) of the dogs were the only pet in the household and the remaining 11 (18%) shared the home with other animals, including cats, birds, fish or rabbits.

## **Discussion**

As with all behaviours exhibited by adult animals, this anxiety related disorder is a product of the animal's genetic predisposition and what it has learned from previous experiences as well as the environment in which it currently finds itself (McFarland 1985, Hunthausen and Seksel 2002).

In contrast to these data, McHarg et al. (1995) stated that about half of the dogs owned in Australia were purebreds. The overrepresentation of purebreds in the group presented for behavioural advice may reflect a greater genetic propensity in purebreds but could also be attributed to an increased likelihood that owners of purebreds would seek attention for their dogs.

Large dogs are overrepresented compared to the McHarg et al. (1995) survey, which found that 77% of Australian dogs were small-medium in size. There are

several possible explanations. Large dogs are capable of greater “nuisance”—they bark louder, are capable of greater damage and may be more likely to be kept outside where they annoy neighbours.

Most dogs in the study had been obtained from their breeders, differing from the belief that shelter dogs are more likely to exhibit this condition. Most shelters in Australia now use some form of behaviour assessment to determine the suitability of dogs for rehoming, and this may contribute to the lower than expected number from shelters.

The composition of the households of owners in this study differed significantly from the general population of dog owners. McHarg et al. (1995) stated that typically, the major carer of the pet is female, married with children, living in the suburbs and most likely employed.

Baldock (personal communication) examined the characteristics of households containing dogs and found that 13 percent lived in single person households, 25 percent with couples, and 62 percent with groups or families.

Couples without children are thus significantly overrepresented compared to Australian data on dog ownership. There are several possible explanations. Couples without children may have more available funds to cover the cost of a behavioural consultation or they may bond more closely to their companion animals and so be more aware of their behaviour and more motivated to seek assistance. Those households without children may also work longer hours.

McHarg et al. (1995) reported that 70 percent of dog owning households contained just one dog, a significantly proportion than was contained in this study. It appears that the presence of another dog does not assist owners to avoid or manage separation anxiety.

## **Conclusions**

This short initial study has posed a number of questions for further investigation. These include associations between the items of raw data for separation anxiety and comparison with data for other behaviour problem categories presented to the practice.

The possible relationship between separation anxiety and time spent without human company also needs further investigation.

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**Keywords**

*dog, household composition, separation anxiety, sex, source*

# **Classical Counter-Conditioning as a Treatment Modality for Dogs (*Canis familiaris*) Showing Aggression Toward Other Dogs on Walks**

**D. F. Horwitz**

## ***Introduction***

Dogs on walks may show a wide range of responses when they visually or physically encounter other dogs. While some dogs are friendly, many show aggressive responses. These aggressive responses vary across the range of typical canid aggressive responses including growling, snarling, barking, lunging, snapping or biting. Even when leashes restrain dogs, fights can occur. Roll and Unshelm (1997) noted that dog fights in Germany occur most often in public with 74.8% on streets and sidewalks and 9.2% in public parks, and up to 56.3% of the animals were off leash at the time of the fight and 13% of aggressors and 35% of the victims were on a leash at the time of the fight. These findings indicated that owner behavior played a role in canine aggression toward unfamiliar dogs. Various underlying motivations have been postulated for aggression toward unfamiliar dogs. Mertens (2002) mentions fear, territoriality, competition, learned behavior and inadvertent reinforcement as potential factors in aggression toward unfamiliar dogs. Sherman et al. (1996) found that aggression toward unfamiliar dogs was associated with dominance aggression toward the owners and out of control behavior and perhaps lack of owner leadership and may be like social territorial aggression in wolves.

A number of treatment options have been offered to help change the aggressive behavior. The most common treatment modalities include a combination of counter-conditioning and desensitization. Counter-conditioning is usually described as teaching the animal a new task that is incompatible with the previous response. In

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*Veterinary Behavior Consultations, 11469 Olive #254, St. Louis,  
Missouri USA 63141*

Corresponding author: debHdvm@aol.com

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companion animal behavior the dog is taught to sit/stay while showing relaxed body postures and facial expressions. After this task is learned, and once a stimulus gradient has been established and the range of responses of the pet to the stimuli is understood, desensitization is attempted. The animal is slowly exposed to the stimulus at a low level and asked to perform the new task and rewarded for the appropriate response. This method can be quite effective in changing previously learned associations and associated behaviors; however, it is laborious and often difficult for owners to accomplish. Obstacles include correct identification of the inciting stimuli, understanding the process, having adequate skills to train the pet and setting up and executing training sessions. Therefore, alternate methods that are easier to understand and implement would be useful for practitioners and for owners. The aim of this presentation is to examine an alternate method of treatment and determine client compliance and satisfaction. Instead of traditional counter-conditioning and desensitization techniques, the owners and their pets were taught a technique of classical counter-conditioning (Schwartz and Robbins 1995) and how to increase owner control.

### ***Materials and Methods***

Cases were recruited from the author's behavior referral practice. Cases were not standardized; the ones chosen are cases with follow-up that would allow evaluation of the methods used and presented here as a series of case studies. Each client filled out a history form prior to the appointment, which was then reviewed, and further details added during the consultation. Information obtained included baseline information about the pet, family, home environment and the problem history. Problem behavior information (aggressive behavior toward other dogs while being walked on a leash) included detailed description of the dog's behavior, owner responses and previous treatment solutions attempted. At least three recent episodes were detailed and attempts were made to establish both a distance gradient and a response gradient for the pet. Information included responses when the pet first visualized another dog, when the approaching dog was within three to five feet from the owner and pet, and once the dog had passed the owner and pet. A gradient of reinforcers were also established for each dog. The dogs involved in this paper may have had additional behavioral diagnosis for which other treatment regimes were recommended, those would not be detailed here. The following treatment recommendations were given to the owners of the dogs discussed in this paper.

If not already using a head collar type restraint device, the dog was fitted by the author with a Gentler Leader Headcollar® (Premier Pet products, Virginia, USA); if they were wearing another type of head collar and it was useful, no change was made. The owners were taught three tasks to aid in changing the dog's behavior. All dogs were to be on a command-response relationship with all family members in day-to-day interactions. This has been variously called "Nothing in life is free" (Voith and Borchelt 1982) and "Learn to earn" (Campbell 1973) and was used

to help increase control and response to commands. Owners were shown how to teach their pet to “focus” or “watch me” which required the dog to look at the owner while in a sit position and be relaxed. Finally, the owner and dog were taught a “back out” (Silvani personal communication) command. This exercise was designed to teach the dog and owner to turn 180 degrees and quickly begin walking in the opposite direction. For both “watch me” and “back out”, highly valued food rewards were to be utilized but eventually phased out in training.

The owners were not to take any walks until the dog had learned both the “watch me” and “back out” commands well. Once walks were reinstated the head-collar was to be used on all walks. When on a walk the owner was to carry with him or her the high value reward as previously identified for each dog. When a person walking a dog was seen at the distance predetermined not to result in the aggressive response, the owner was instructed to ask the dog to sit and “watch me” and begin feeding the dog the highly valued reward. The dog would receive the reward regardless of their behavior. When the dog and person approached the predetermined distance where undesirable behavior was likely to first begin, the owner was to “back out” and promptly leave the area and stop feeding treats. If at anytime the owner and dog unexpectedly encountered another dog and person they were to back out immediately and quickly leave the area. The owners were also told not to use punishment or physical reprimands. At no time were they to attempt to greet other dogs and all efforts should be made to stay at a distance unlikely to evoke the aggressive response.

## **Results**

Owners reported teaching their dog the various tasks (“watch me” and “back out”) within one or two weeks. Once owners understood the distance gradient most were able to get the dog to focus for the food reward without aggressive responses and then “back out”, as the person and dog got closer. With subsequent repetitions owners reported that people and their dogs could get closer before they felt they had to leave the area. Often after several repetitions, the dog would look toward the owner when it saw a person and dog approaching as if anticipating a food reward. Dogs that were not restrained were problems for all owners since the dog might approach before the owner could leave the area. Most owners reported improved behavior on walks within one to two months. Some owners even allowed short greeting behavior with other dogs without adverse responses. A few owners were able to walk by other dogs using a command to “focus” and food rewards without any aggressive responses as well. Since these are case studies no statistics are presented.

## **Discussion**

None of the elements in this program are new or novel and the “watch me” is often used in training classes. Other authors have used classical counter-conditioning techniques for many problems, most notable Jean Donaldson (1998) and the “bar is

open, the bar is closed” technique. The techniques described here work best if the owner is familiar with training and already has some control over the pet. The advantages of this technique include not needing to set up training sessions with other dogs, using the dogs they encounter on walks and the results are usually seen relatively quickly. The disadvantage is that it does not specifically address the underlying diagnosis but is only aimed at changing underlying emotional state of the pet and hopefully outward behavior. Even after the program, many dogs may not be able to greet or play with other dogs, although they walk on a leash without incident. In some cases dogs may still respond if another dog surprises them or comes too close. Managing owner expectations prior to therapy and throughout the process can help overcome some of these obstacles. In other cases additional treatment with more standard techniques may be required.

### **Conclusion**

The techniques described here appear to be useful in helping owners manage dogs that show aggressive responses to other dogs on walks. Owners of dogs with very little training experience may have difficulty with this program. If owners wish their dog to play with other dogs or run off leash with other dogs, this technique alone is not usually sufficient.

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### **Keywords**

*aggression, counter-conditioning, dog, walks*

# The Treatment of Fear of Fireworks in Dogs (*Canis familiaris*): A Prospective Study

**E. D. Levine\*, D. Ramos, D. S. Mills**

## **Introduction**

Noise fears and phobias among dogs (*Canis familiaris*) is a commonly reported behavioural problem (Beaver 1999, Overall 1997, 2002 Landsberg 2003). Fear of fireworks is an increasing problem for dogs due to the increasingly ubiquitous use of fireworks during many holidays and celebrations. It is essential that effective treatment plans be implemented as dogs that are repeatedly exposed to fearful events (or are phobic) may experience decreased levels of welfare (Ladewig 2000, Hydbring-Sandberg 2004, Dreschel 2004, Beerda et al. 1997). Historically, treatment methods for fear related behaviour involved desensitization and counter-conditioning (DS and CC) methods (Wolpe 1958, Keehn 1979). It is common for veterinary and animal behaviourists, to suggest DS and CC methods using CD or tape recordings of that particular noise(s). There is, however, little empirical evidence of the efficacy of a CD based DS and CC program in home settings of dogs without the concurrent use of medication. The aim of this study was to evaluate the efficacy of CDs for treating dogs with a fear of fireworks in a home setting with the use of Dog Appeasing Pheromone (DAP, Ceva Santé Animale).

## **Materials and Methods**

Fifty-four dogs with a fear of fireworks were enrolled in an eight week prospective study to evaluate the efficacy of two CD based desensitization and counter-conditioning programs with the use of DAP. Participants were recruited via flyers at

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*Animal Behaviour, Cognition and Welfare Group, Department of Biological Sciences, University of Lincoln, Riseholme Park, Lincoln, LN2 2LG, UK*

\*Corresponding author: [elevine@lincoln.ac.uk](mailto:elevine@lincoln.ac.uk)

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local veterinary clinics and a press release to the local media. The dates of the study were August through October 2004. Telephone interviews with potential participants were completed to ensure they met the inclusion criteria. Those that met the inclusion criteria were sent a behavioural history form, a baseline firework fear behavioural questionnaire, and a self addressed and stamped envelope. A general meeting was held for all participants at the University of Lincoln's Animal Behaviour Clinic to discuss the objective of the study, review what would be required of them throughout the eight weeks, and to acquire informed consent. Contact information regarding participants' veterinarians was collected and letters to the veterinarians asking for permission for their clients to participate was obtained. Each dog received a physical exam prior to enrollment and each participant had a behavioural interview with regards to their dog. Both the physical exams and the behavioural interviews were administered by the same qualified veterinary behaviourist. Any dogs with medical conditions that may have compounded, caused, or exacerbated the fear of fireworks were excluded from the study. Dogs with separation anxiety or aggression directed at veterinarians (which prevented the required initial physical exam) were excluded from the study. The distribution of the CDs to participants was matched based on global severity scores.

Owners were told to read and follow the instructions (both of which suggest using DAP) that accompanied their respective CD. The owners were not given any clarification of the directions that accompanied the CD at this time. Half of the participants received a programme called Fear of Fireworks (FOF, Fear of fireworks.com) and the other half a programme called Sounds Scary (SS, Sounds Scary Ltd). DAP was distributed to all participants. Throughout the eight week study, all participants were called once a week and were asked questions pertaining to the use of the CD (e.g. how many times did you play the CD this week, how long was each session) and the dog's behavioral response to the CD (i.e. frequency and intensity of individual fear related behaviours). After week 1 owners were given specific instructions on what constituted a safe haven. After week 4, all owners were given basic information pertaining to some key principles of using DSand CC programs with respect to fear of noises in light of commonly identified errors relating to the use of the programs (e.g. explaining what ignoring entails). Following the completion of the study, two telephone exit interviews were completed following holidays in which fireworks are traditionally set-off (Nov 5th, Dec 31st ). For both exit interviews the same individual fear-related behaviour questions were asked as those prior to the study and the owners were, again, asked to give a global fear score. Questions pertaining to owner satisfaction were asked at this time as well. The first exit interview was conducted in mid-November. The second exit interview was conducted in mid-January. During the time between these exit interviews, owners were not required to use the CD or the DAP. Data were not collected on fear related behaviours (TSS, global score) or on owner opinions on the efficacy of the CD ther-

apy, if the dogs had not experienced real exposures. This study was approved by the University of Lincoln's Ethics Committee.

The behavioural questionnaire contained questions pertaining to the behavioural and medical history of the animal and was adapted from the history form used in the University of Lincoln's Animal Behaviour Clinic. In the firework fear questionnaire, owners identified both the frequency and the intensity of individual fear-related behaviours in which their dogs engaged during fireworks while inside the home. Answer options for frequencies of behaviours were never, rarely, frequently, and every time. Answer options about intensity of a behaviour were numerical ratings from 1 to 5 with 1 being a small amount and 5 being an extensive amount. The owners were also asked to assign a global score on a range form 0–10 relating to their perception of their dogs' firework fear. Zero related to a mild fear response whereas 10 was the most severe fear response. An option to say there was no fear present was also provided at follow up.

The severity of individual behaviours was calculated by multiplying the frequency and the intensity of that behaviour. The total severity score for each dog was calculated by summing the severities of each behaviour. Total severity scores were calculated during week 1, week 4, week 5, and week 8 of the trial to evaluate the dogs' response to the CD itself. The Wilcoxon sign test was used to analyze the differences between the total severity scores between week 1 and week 4 and between week 5 and weeks 8. The Wilcoxon sign test was also used to analyze differences between individual behaviours after the first and second month of CD training.

Total severity scores were also calculated for each dog both prior to the treatment program (baseline total severity scores) and at each exit interview. Data were collected and analyzed using non parametric techniques (Minitab 13.0). The Wilcoxon sign test was used to analyze the difference in pre and post treatment total severity scores, global scores, and in individual fear related behaviours for all dogs. The data were subdivided into two groups based on which CD was used and analyzed separately, but these results are not presented in this paper.

Data relating to the owners' overall satisfaction with the treatment therapy, if they would use this treatment program again if they were to acquire another dog that was fearful of fireworks, and the percentage of owners that continued to use the CD and DAP following the exit interviews were also collected. Data pertaining to those that voluntarily chose to continue using the CD and DAP following the first exit interview were also collected.

## **Results**

Seventy percent ( $n = 38$ ) of dogs completed the eight week treatment program. Reasons for owners not completing the study varied but included lack of time to play the CD and family or personal health reasons. One individual strongly disagreed with the idea of giving treats as a method of counter-conditioning. Of those con-



tacted for the second exit interview, 30 had dogs that were exposed to real fireworks in between exit interview one and exit two.

Dogs exhibited significant improvement in their behaviour towards the CD after the first month of listening to the CD ( $p = 0.0001$ ).

With regards to real exposures, dogs showed significant improvement in their total severity scores at both exit one ( $p < 0.0001$ ) and exit two ( $p < 0.0001$ ) when compared to their baseline total severity scores. There was no significant improvement or decline between the exit interviews ( $p = 1.0$ ). There was significant improvement with respect to the global scores as well when comparing baseline to exit one ( $p < 0.0001$ ) and exit two ( $p < 0.0001$ ). There was no difference in global scores between the exit interviews ( $p = 0.82$ ). With respect to individual behaviours, there was significant improvement in 13 out of 17 behaviours at both exit one and exit two. There was no significant improvement or decline in any individual behaviours between exit one and exit two. The majority of clients was satisfied with the results and would consider using firework CDs as a method of helping other dogs.

After the second exit interview, owners were asked how they felt the CD treatment had affected their dog's response to fireworks. Twenty-one percent reported that their dog showed no change at all, 10% reported that their dogs had improved slightly, 31% reported a moderate improvement, and 38% reported that their dogs had greatly improved. No one reported that their dog's behaviour was worse. With respect to owner satisfaction with the results, 17% were not satisfied at all, 7% were mildly satisfied, 24% were moderately satisfied, and 52% were very satisfied. When asked if they would repeat this treatment if they were to acquire another dog that was scared of fireworks, 93% said they would use the CD therapy again. Between the first and second exit interviews, the owners were not required to use either the CD or the DAP. When asked if they chose to continue using them, 65% reported that they had not continued use of the CD; whereas 34% had continued its use. Of those that had continued to use the CD, 80% used it up to 4 times in the two month interval between exit interviews, and 20% used it between 5–8 times. The majority of individuals who did play the CD, played it up to 15 minutes/session. With regards to continuing use of DAP, 45% discontinued it and 34% had actively continued its use, the remainder of individual reported that the DAP ran out at some point during the two month interval and they had not replaced it. There was no association between percentage of improvement at the first exit interview and the continued use of both the CD and the DAP.

## **Discussion**

It is important to note that much of the behavioural improvement to the CD came within the first month of training. This is important as during the first month no advice was given with the exception of advice about the safe haven; therefore, it ap-

pears that *if* clients read the instruction booklets provided, they are able to successfully implement a treatment process. The study participants knew they were going to be monitored every week which may have encouraged them to read and follow the instructions, more completely than a non-selected sample. In addition, despite variations in sound systems in the home, it appears that the CDs were broadly effective. Only two dogs did not respond behaviourally to the CDs (these dogs were given the opportunity to listen to three firework CDs and they did not respond to any of them). One dog became sensitized during the CD training and therefore, the training was discontinued, before exit interview one.

### **Real exposures**

The results indicate that CDs in combination with DAP are efficacious as a treatment modality in dogs that have a firework fear. However, the treatment in this case required individuals to be highly motivated/dedicated to do the treatment program. The fact that there was no significant difference between scores between the exit interviews implies that at least two months after completing the CD training, any therapeutic effects remained despite the high number of individuals who opted not to continue playing the CD or using the DAP. A follow up is intended to be conducted at twelve months.

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**Keywords**

*dog, fear, noise, owner, treatment, welfare*

# The Effect of Emotional Content of Verbal Commands on the Response of Dogs (*Canis familiaris*)

**D. S. Mills\*, M. Fukuzawa, J. J. Cooper**

## **Introduction**

It has been suggested that dogs (*Canis familiaris*) have become sensitive to human communicative signals as a result of domestication and breed diversification, especially the directional cues of handlers (Topal et al. 1998; Soproni et al. 2001). If this is the case, it might be expected that there would also be selection for improved comprehension of human speech, since the use of commands has been integral to the function of dogs in their relationships with humans. Commands are not simple discriminative stimuli; they change their sound between handlers and emphasis may vary with context, e.g. speech often changes its quality when there is a difference in urgency in the message being communicated. However, the interaction between the emotional content of speech sound and dog behaviour has not been the subject of much serious scientific investigation. The aim of this study was to conduct an initial assessment of whether or not dogs discriminated between similar commands delivered with different emotional emphasis.

## **Subjects and Methods**

Ten pet-dogs (four male, six female) were trained individually in six stages, to respond reliably to two commands “sit” and “come” with the experimenter hidden behind a screen (see Fukuzawa et al. 2005a for a full description of the method used). Test sessions were organised into two parts: a pre-test series of commands

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*Animal Behaviour, Cognition and Welfare Group, Dept of Biological Sciences, University of Lincoln, Riseholme Park Lincoln LN2 2LG U.K.*

\*Corresponding author: dmills@lincoln.ac.uk

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and an experimental command. In the pre-test situation, both commands were presented with no obvious emotional emphasis randomly until the dog instigated a quick correct response to both commands on five successive occasions. Then the trainer presented a sixth command which varied in its emotional content. This was with sighs ('gloomy'), with intense stress ('angry'), with a cheery high-pitch ('happy'), or without alteration ('neutral'). The dog's response to each of these commands was assessed using response latencies. The relationship between commands was investigated with a general linear modal analysis of variance to assess evidence of a significant difference in response time between the different forms of command and with a linear regression to examine the relationship between each of the commands containing emotional emphasis and the 'neutral' one.

## **Results**

The initial analysis of variance revealed no significant difference between the response times to the different commands, but response time differed significantly between individual dogs. The regression analysis revealed a significant relationship between the response times to the 'happy' and 'neutral' tones for both commands ("sit",  $r = 0.77$ ,  $p < 0.001$ ; "come",  $r = 0.56$ ,  $p < 0.05$ ). The correlation between 'neutral' and 'angry' ("sit",  $r = 0.41$ ,  $p = 0.06$ ; "come",  $r = 0.19$ ,  $p = 0.21$ ), and 'gloomy' ("sit",  $r = 0.09$ ,  $p = 0.44$ ; "come",  $r = 0.55$ ,  $p < 0.05$ ) was more variable.

## **Discussion**

There was great individual variation in response times, but the results suggest that whilst the response to an emotionally neutral command might predict response to a happy command, this relationship is less predictable when the command is issued with negative emotion. Thus there is no clear evidence of dogs responding with generally consistent differences to commands with different emotional content.

The significant variation between individuals might be a result of different learned associations between the emotional content and its consequences in different subjects and deserves further investigation.

There was a high correlation between response times for neutral and happy commands, suggesting predictability and reliability in performance between the two. Thus dogs appeared to show consistent individual patterns of response to the commands when they were presented neutrally or positively. By contrast, the correlation between the 'neutral' command and those with negative emotional quality was more variable. Since commands were issued out of sight of the test subject, these results suggest that dogs can discriminate certain features of commands purely on the basis of their emphatic tonal quality. This has important practical implications—when owners change emphasis in the way they speak to their pet, they might be obscuring the command rather than enhancing it as they may hope. The results

could also be interpreted to mean that a dog's behaviour becomes less predictable when commands are issued in a negative way. This is consistent with the opinion that dogs do not interpret commands as simple discriminative stimuli, but attend to a range of signals when a command is given (Mills, in press). This is understandable, since, in practice, the consequences of obeying a negatively delivered command are less likely to be predictably favourable for the dog. Whilst there might be an innate relationship between activity and certain sound qualities (McConnell 1990), it might also reflect learned associations. In particular, it is not unreasonable to suggest that angry and perhaps, gloomy commands are more likely to have been associated with more variable experiences for the dogs that were owned by different people. These forms of the command might also be associated with less predictable owner behaviour. Whilst it might be thought that gloomily spoken emotions would be novel to a dog, it is also possible that they may have been used by an owner when he/she was exasperated with the animal for failing to respond sooner.

Since dogs recognise subtle differences to the phonemic structure of commands (Fukuzawa et al. 2005b) the inconsistency between the two types of response required for both of the negatively spoken commands might also theoretically be the result of greater phonetic similarity with the neutral command for one command over the other; i.e. the gloomy "come" sounded similar to the neutral version of the command but the gloomy "sit" did not; conversely the angry "sit" sounded similar to the neutral version of the command but the angry "come" did not. However, post hoc, sonographic comparisons suggest this is probably not the case. A third possibility is that the dogs were generally familiar with gloomily spoken "come" commands and angrily spoken "sit" commands, but not the gloomily spoken "sit" or angrily delivered "come." On the basis of our experience, we consider this explanation unlikely too.

## **Conclusion**

This study has shown that changing the emotional content of a command has the potential to affect the response of dogs to that command, independent of any change in body language. It seems dogs might also distinguish between positive and negative emotional content of commands. Negative affect appears to produce a less consistent response. This has obvious practical and welfare implications for dog training. In short, owners and handlers should be encouraged to always be positive about their dog's obedience, even when the response is not as they would desire.

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**Keywords**

*command, dog, emotion, obedience, training*

# Hereditary Fear, Panic, and Anxiety in Dogs (*Canis familiaris*)

**K. L. Overall<sup>\*</sup>, D. Dyer<sup>1</sup>, A. E. Dunham<sup>2</sup>,  
L. Schechter<sup>3</sup>, S. P. Hamilton<sup>4</sup>**

## ***Introduction***

Anxiety disorders involving panic and social withdrawal are among the most common behavioral concerns in human and veterinary behavioral medicine. Many dog breeds exhibit what has been variously described as extreme “fear/shyness/nervousness/panic/anxiety” accompanied by social withdrawal. This condition is usually familial. The phenotypes of these anxious dogs can be discretely characterized using behavioral and physiological responses to the lactate test. Preliminary data exist for three groups of dogs: (1) clinical canine patients diagnosed with separation anxiety or noise / thunderstorm phobia, and normal control dogs; (2) colony dogs derived from two different breeds in whom the extreme anxiety exhibits significant, developmentally expressed physiological responses in affected dogs that are consistent with findings in anxious humans; (3) colony dogs derived from beagle × cocker which were then purpose-bred for fear. Using physiological and behavioral tools to investigate the pattern of responses and to more adequately define a set of phenotypes in affected dogs, we now know that (a) the physiological lactate test provokes differential responses in affected v. unaffected dogs, (b) the behavioral responses succeed the physiological ones in ontogeny, (c) the extent of the response is variable

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<sup>1</sup>*Center for Neurobiology and Behavior, Psychiatry Department, School of Medicine, University of Pennsylvania, Philadelphia, PA, 19104-6140, USA*

<sup>2</sup>*Biology Department, University of Pennsylvania, Philadelphia, PA, 19104-6018, USA*

<sup>3</sup>*Wyeth Research, Princeton, NJ, 08543, USA*

<sup>4</sup>*Langley Porter Psychiatric Institute, UCSF, San Francisco, CA, 94143-0948, USA*

<sup>\*</sup>Corresponding author: overallk@mail.med.upenn.edu



and (d) some behaviorally unaffected dogs may exhibit physiological endophenotypes. These results justified the search for a breeder interested in understanding the genetics of fear in their lines. To protect the breeder's confidentiality, the breed studied here is known only as breed X, a purebred breed with extensive pedigrees.

The focus of the current Phase 1 study is purely behavioral and genetic with the intent of phenotyping all available breeding dogs using the behavioral methods developed in the aforementioned studies, and collecting DNA for pedigree analysis and mapping.

Clusters of behavioral patterns that are time penetrant should correlate with both the ontogenic progression of the phenotype and with otherwise non-specific responses to a provocative behavioral test.

By providing as complete a phenotypic description as possible, detailed categorical and quantitative phenotypic variation can be classified and later examined in the context of future first-pass genome scans. In this way we avoid discarding information that may be contained in patterns of how variation in behavior and physiology cluster. Families and breeds of dogs are also ideal for haplotype analysis in a way that is often not possible or simple in humans. The canine map is now sufficiently well known that it will likely be useful for studies such as this one, where the canine condition parallels or mirrors that in humans, and for which multi-generation canine, but not human pedigrees are available.

This report focuses on the preliminary behavioral assays of the breeding dogs.

## **Materials and Methods**

At least one-fourth of these breed X dogs show profound fear and withdrawal when exposed to an unfamiliar human. Three to five generation pedigrees are available for every breeding dog. Some males may be bred to multiple females in various generations—a pattern that is ideal for haplotype analysis.

All dogs were evaluated for their response upon being approached by a strange human. The human sat quietly and watched the target dog for at least 5 minutes. The dogs' behaviors at each minute were recorded on a tick sheet that ranks the intensity of each anxiety-associated behavior.

The frequencies of different behaviors were analyzed to test the null hypothesis of no inter-dog differences in the observed frequencies of these behaviors [90]. These analyses were done using PROC FREQ in SAS using  $\alpha = 0.05$  as the critical level of significance. A series of *a posteriori* contrasts (Tukey's HSD) was used to ask whether there are clusters of dogs with similar behavioral profiles (i.e., sets of dogs that do not differ significantly in these variables).

## **Results**

The 400 + dogs evaluated to date show a remarkable profile of anxiety reminiscent of the original nervous pointers (Murphree and Dykman 1965, Murphree et al.

1967). When their behaviors are plotted on a frequency graph there is a bimodal distribution with clusters represented by one peak targeting calm and more normal behaviors and another targeting more anxious behaviors. This is the ideal distribution for examination of the genetic relationships as we have discussed here. These data strongly suggest that behaviors of dogs are not random, that pedigrees can predict adult behaviors, that multiple genes or dosage effects may be important, and that gene mapping with linkage analysis should be possible within this breed.

## ***Discussion***

Because anxiety disorders in dogs occur naturally and mirror the equivalent condition in humans, validity criteria for animal models may best be met by using dog models. In this case the dog's behavior simultaneously provides both an animal model and the ability to study canine behavior that is naturally pathologic, without preconceptions of mechanism or outcome, and without the necessity of coupling a trait, mechanism, or outcome to a homologous one in humans. Because of this, dogs may provide new insights into pathologic behavior that are unlikely to be generated by studies in rodents.

Rodent models of anxiety may be fundamentally flawed because, as prey species, chronic anxiety and wariness is adaptive. Natural canine models may be the next step in refining the model paradigm and for testing putative results from rodent models. Dogs share both foraging mode and a virtually identical social system with humans, and have co-evolved for co-operative work with humans for approximately 135,000 years, with intense selection for specific suites of behavioral traits (e.g., the development of breeds) occurring in the last 12,000–15,000 years (Leonard et al. 2002, Vilà et al. 1999). Dogs mirror humans in hallmarks of social development (Overall 2000). Also, like humans, dogs suffer from what we recognize as maladaptive anxiety—that which interferes with normal functioning—which was selected against during the co-evolution of dogs and humans. In contrast, rodent evolution produced anxiety-related behaviors that are considered adaptive in rodents, but maladaptive in dogs and humans. Yet these behaviors have been the cornerstone of anxiety-related behavior studied in rodents, which is a concern if underlying mechanism is of interest (Overall 2000).

Recent data indicate that dogs are significantly more comparable to humans than are chimpanzees and wolves with regard to the complex social cognition involved in understanding long-distance signals that indicate where food is hidden (Hare et al. 2002). Dog breeds were developed on the basis of specific work or jobs (e.g., border collies, Australian shepherds, Australian cattle dogs [herding]; Labrador retrievers [retrieving in water]; beagles [alerting for hidden prey]; Jack Russell terriers [tracking and killing small prey], et cetera). If breeds selected for different behaviors or jobs express different manifestations of extreme anxiety, characterization of the response for different pedigree lines may provide hypotheses to be tested

about composition of “spectrum” disorders. Finally, dogs may provide a fast-track for genome scans and mapping since breeds, by definition, are the result of canalized genetic variation, and when a trait appears in a breed line it is likely that there is accompanying line breeding which can be identified by multi-generational pedigrees (Shekhar et al. 2001).

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## Keywords

*animal model, anxiety, fear, genetics, heredity*

# **Evaluation of DAP's Effect on Reduction of Anxiety in Puppies (*Canis familiaris*) As Well As Its Usefulness in Improving Learning and Socialization**

***S. Denenberg\**, *G. M. Landsberg*<sup>1</sup>, *E. Gaultier*<sup>2</sup>**

## ***Introduction***

The main objectives of puppy classes are the learning of basic commands and socialization to other dogs and people in the class. In these classes some puppies exhibit several behavior patterns such as fear, anxiety, excitability and high arousal level that reduce their ability to learn new commands and to be effectively socialized. Ultimately this may have an effect on the owner pet bond. Dog Appeasing Pheromone (DAP; Ceva Santé Animale) is a synthetic analogue of a compound secreted from the intermammary sulcus of bitches shortly after whelping (Pageat and Gaultier 2003) and has calming effects on dogs, both puppies and adults. Previous studies demonstrated the efficacy of DAP in reducing anxiety and stress (Gaultier and Pageat 2002; Heath and Bowen 2004; Sheppard and Mills 2003) thereby facilitating better learning. DAP also showed usefulness in introducing dogs to new environments or unfamiliar environments and reducing fear (Gaultier et al. 2005; Mills and Hargrave 2004; Tod et al. 2004). DAP can be used alone or as adjunct to other behavior modification techniques such as in desensitizing and counter conditioning (Heath and Bowen 2004; Mills et al. 2003).

It is expected that DAP might improve learning, increase sociability and reduce fear and anxiety in puppies. Therefore, the purpose of this study was to evaluate the effects of a DAP collar on reduction of fear and anxiety in puppies, as well

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*Ridge Veterinary Hospital, Medicine Hat, AB, T1B 4R2 Canada*

<sup>1</sup>*Doncaster Animal Clinic, Thornhill, ON, L3T2K9 Canada*

<sup>2</sup>*Phérosynthèse, Le Rieu Neuf, F84490, St Saturnin-d'Apt, France*

Corresponding author: [sagid@shaw.ca](mailto:sagid@shaw.ca)

its usefulness in improving learning and socialization in comparison to puppies wearing a placebo collar over the course of an 8 week puppy class.

## ***Materials and Methods***

Forty-five puppies between the ages of three and eight months participated for the first time in puppy classes for socialization and basic training. The inclusion criteria included age, health status and no previous training or puppy classes. There were four separate puppy classes; two with large breed dogs and two with small breed dogs. One class of large breed and one class of small breed dog received DAP collar and the other two classes received placebo collars. The same trainer taught both the DAP and placebo groups but the classes were held on different days to insure that there was no transfer of DAP vapors to the puppies in the DAP groups. The trial design was randomized and blinded so that none of the puppy owners, the trainers, and the author (who tabulated the results) were aware of which puppies were given the DAP collar.

Before the first class and after each class the trainer and each owner completed a questionnaire, evaluating the puppy's learning, fear, and excitability, interaction with other puppies and the owner's satisfaction level with the puppy's progress. Each question was ranked on a 5 point scale and the owners had to evaluate the puppy.

Owners were asked to keep the collar on their puppies for the entire eight week class length. Since the collars were determined to release DAP for four weeks, each collar was replaced after the first four weeks. At the end of the classes the results were analyzed using quantitative and qualitative measurements (Analysis of variance and paired T-test), comparing the DAP group to the placebo group.

## ***Results***

The puppies in the DAP group showed improvement in learning, and a reduction in fear and anxiety levels. Puppies in the placebo group also improved but to a lesser extent. However, there was no significant difference between the two groups. One explanation for the lack of statistical significance might be explained by the number of puppies in each group who completed the classes. At the beginning of the classes the DAP and the placebo groups had 23 puppies and 22 respectively. However, by the end of the classes the DAP and the placebo groups had 21 and 11 respectively. The primary reasons for dropout were related to behavioral issues and owner satisfaction (i.e. three behavior problems, five owner satisfaction, one medical problem of the owner and two medical problems of the puppy). Another variable was that puppies in the DAP group had had a lower average starting score (week zero) for learning as compared with the placebo group puppies (2.31 and 2.7 respectively). At the end of the puppy classes the DAP group showed marked improvement com-

pared with the placebo group (4.16 and 3.6 respectively). Both the puppies and their owners in the DAP group appeared to be more relaxed during the classes as compared with the placebo group. When adding the puppies that dropped the classes from both the DAP and placebo groups the results are even more dramatic in favor of the DAP group (final average of 4.16 vs. 2.38.  $p < 0.05$ , paired T-test).

All other parameters (i.e. excitability, fear, and interaction) show the same pattern with no significant differences between the groups when comparing only the puppies that finished the classes. However, when including all puppies there is a significant difference between the groups.

The number of puppies remaining in the class after drop out may also have had an effect on the outcome. There were eight puppies on an average in each class of the DAP group while in the placebo group, because of the higher number of drop outs the average was five. Because of the class size, the DAP groups were louder and lasted 10 minutes longer on an average and this may have influenced the level of fear and excitability, as well as learning.

Seventy one percent of owners in the DAP group and 68 percent of the owners in the placebo group reported behavior problems (i.e. separation anxiety, fear, aggression, unruly, biting/nipping and house soiling) before the classes. Sixty five percent of the DAP group owners reported an improvement of over 80% in these problems by the end of the classes and only 27 percent of the owners in the placebo group reported a similar level of improvement. Seven percent of the owners of puppies in the placebo group and four percent of puppies in the DAP group reported that new behavior problems arose during the classes. By the end of the classes all of these new problems were resolved in the DAP group and they all persisted in the placebo group. Behavior problems (such as, unruly, excessive vocalization, play aggression, and separation anxiety) were the major cause for dropping the classes.

### ***Conclusion and Followup***

DAP may improve learning and training by reducing the level of excitability/arousal and fear/anxiety. At this point in time the statistical results are not significant and further study is required to evaluate each parameter separately (i.e. fear, excitability, interaction with other puppies, and learning). One factor that greatly affected the results was the greater number of puppies that dropped out of the placebo group and the number of puppies that completed the classes. There are significant differences between the groups when comparing the whole group including puppies that attended less than 75 percent of the classes. This leaves us with the question of whether the improvement in learning and socialization would have been significant had all of the puppies completed more than 75 percent of the classes and whether the DAP helped to reduce drop out. Future study should focus on trying to maintain an equal number of puppies in each group by finding ways to minimize the drop out

rate. Further investigation into the causes of puppy class drop out might therefore be warranted.

Socialization was measured using several different parameters (i.e. interaction with other dogs and people and the reaction to different and new situations and environments) and was followed at one and three months following the end of classes and will again be followed at six months. Initial data from the one and three month evaluations shows that 82% of the DAP group owners rate their puppies socialization level as high to very high (three or four on a five point evaluation scale) as compared with the 21% of the placebo group owners. There was a trend of decreased socialization scores between the one month and the three month evaluation in both groups.

In summary, although comparing the DAP group to the placebo group for puppies that did finish the entire class did not show significant differences between the DAP and the placebo groups, one cannot ignore the fact that more puppies left the placebo group due to behavior problems and that a greater number of behavior problems were resolved in the DAP group by the end of the puppy classes. Although blinded throughout the course of the trial, the owners, the trainers (each trainer taught one DAP and one placebo group) and the author all observed major differences between the groups to the extent that they could identify the DAP group from the placebo group early during the trial. DAP appears to be useful in reducing the levels of anxiety and arousal. Puppies in the DAP group were less fearful and learned better leading to higher levels of owner satisfaction and the potential for a much stronger human-owner bond. In addition, preliminary results at 3 months after the puppy classes indicate a trend toward better socialization in the DAP group.

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**Keywords**

*anxiety, DAP, dog, learning, puppy, socialization*



# **Plant Eating in Domestic Dogs (*Canis familiaris*): Characterization and Relationship to Signalment, Illness, and Behavior Problems**

**K. C. Sueda\*, B. L. Hart, K. D. Cliff<sup>1</sup>**

## ***Introduction***

Many theories exist as to why dogs eat grass. Dogs may consume plants to induce vomiting in response to illness to control intestinal parasites, to supplement a deficient diet, or due to behavioral problems such as pica. Plant eating may also reflect an instinctive behavior acquired from wolf ancestors among whom plant eating has been observed. Evaluation of scats and stomach contents of wild wolves indicate that plants, particularly grass, occurs in about 2–10 percent of samples (Mech 1966; Anderson 1998).

These theories rely on anecdotal evidence; none have been scientifically validated or disproved as there has been little research into the plant eating behavior of domestic dogs. The goal of this study was to acquire data about plant eating in domestic dogs and to gather information that might relate to causes of plant eating.

## ***Materials and Methods***

Using strict exclusion and inclusion criteria, an Internet survey was utilized to obtain information from owners of dogs that consumed plants including how frequently their dog consumed plants, what types of plants were consumed, behavior patterns before and after eating plants, diet, medical history and behavioral history.

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*Clinical Animal Behavior Service, Veterinary Medical Teaching Hospital, University of California, One Shields Avenue, Davis, California, 95616-8747, USA*

\*Corresponding author: [kcsueda@vmth.ucdavis.edu](mailto:kcsueda@vmth.ucdavis.edu)

When significant differences between groups were suspected, Chi-squared goodness of fit tests were calculated with two-tailed significance set at  $P < 0.05$ .

## **Results**

Data from 1,694 viable surveys were analyzed. Grass was eaten most frequently. The frequency of plant eating was not related to sex or gonadal status, breed, diet, receipt of antihelminthic medication, or other behavior problems.

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## **Acknowledgements**

The authors would like to thank Stanley Marks for reviewing the survey and providing assistance in formulating survey questions.

## **Keywords**

*diet, dog, illness, vomit*

# **Inappropriate Use of Pain as Punishment in Canine Aggression Toward Household Members**

***M. Alnot-Perronin***

## ***Introduction***

Working as a behaviorist and dealing mostly with aggressive dogs has led me to use and provide methods other than pain to manage these dogs. As concern for animal welfare heightens, it is of paramount importance to educate owners that painful techniques are not necessary to control aggression in dogs. The behaviorist's work is to consider animal welfare in routine treatments and thus eliminate painful techniques from behavioural medicine. In this study, aggression toward human family members is defined as either "a reactive state that can lead to a bite, which occurs in conflicts with the owner" or "aggression that is unpredictable to the owner."

## ***Material and Methods***

This is a retrospective study of cases referred to the author by general practice veterinarians in Paris, France, and its suburbs. Data were collected on 90 out of 200 dogs evaluated for aggression in 2003 and 2004. The patients selected included entire or neutered males and entire or spayed females of various breeds, with an age range of 6 months to 13 years.

The history for each patient was reviewed for more than just the description of the aggression, e.g., bites or growling. First, the medical history was checked. The state of the dog's health was determined by reviewing all diagnostic tests, current medical treatments, vaccination status, and the date of last deworming. Then, the previous behavioural history was reviewed, including a description of the problem as well as the recommendations of behaviour counselors or trainers and any medica-

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*28 rue de Chimay, 28130 Mevoisins, France*

\*Corresponding author: malnot@club-internet.fr

tions or remedies that were administered. In France, many trainers still use positive punishment techniques involving pain. These techniques include using choke collars, smacking, beating with a stick, leash-jerking, pinning, and using electronic collars. Finally, the early history of the dog, if known, was evaluated. This included the age when the dog was obtained, how he was raised, the litter size, and the mother's behaviour—including house training and obedience work. The members of the family were listed, the family's routine and habits, and the home environment, e.g., flat/house, garden or not, the space allowed to the dog, etc. The behavioural consultation described the dog's routine and daily activities. These include both self-related activities and activities related to the environment. Self-related activities described the feeding/diet of the dog, toileting (marking, house soiling and going outside), excessive licking/chewing/scratching/itching, sleeping and waking routine (resting place, quantity and quality). Activities related to the environment described agonistic behaviours, including the moment before and the moment after the bite/threat, the postures of the dog and of the owner during the conflict, and the reason for the conflict (Overall 1997; Pageat 1998; Hetts 1999). Owner-dog interaction and self-confidence of the owner during aggressive behavior were also evaluated (Pageat 1998; Luescher 1999). Other activities—including exploration, staying alone, going outside, roaming, taking-exercise, playing, training, and sexual behaviour or inappropriate mounting—were evaluated.

Because each case involved some component of status-related problems, the treatment plan included techniques to reduce status-related issues even when dominance was not the primary diagnosis. The treatment focused on helping household members change the social relationship between themselves and their dogs in order to establish and reinforce the owner's higher rank and resolve resource guarding issues (Horwitz 1999). Household members were taught to properly interpret their dog's body language and basic dog behavior was reviewed. Most importantly, painful punishment was forbidden.

## **Results**

### **Diagnoses**

Group 1: Behavioural development abnormalities (Pageat 1998) involving play or fear aggression ( $n = 11$ ) related to the dog's lack of socialization or bite inhibition

Group 2: Behavioural but not development-related aggression ( $n = 53$ ) involving competitive or status-related aggression (hierarchy conflicts and aggression related to resource guarding), fear aggression, territorial aggression, or irritable aggression. Most of the conflicts occurred because the social position of the dog was challenged or because the owners misunderstood the dog, leading to inconsistent behavior on the part of the owner that caused anxiety in the dog

Group 3: Pain-induced aggression ( $n = 17$ ) involving ill-treatment of the dog. One dog had been burned with cigarettes by an alcoholic owner; nine dogs had re-

ceived “positive” punishments with electric collars, prong collars, or whips; and seven dogs received “bite work” used in France to train dogs for use in the army, the police and as guard dogs.

Group 4: Painful disorders (aging or other health problems) or organ failure (endocrinological disease) (n = 9). These health issues caused increased anxiety in the dogs.

## **Findings**

Every owner (100%) of the third group had tried using pain as a training technique and failed before coming in for evaluation.

The use of pain can be dangerous for the owner dealing with confrontation or conflicts. Thirty percent of the owners in the second group used some type of painful punishment against our advice and experienced escalating aggression.

Punishment can be an obstacle in learning process. In the first group, two owners beat their dog so they could “win” during a confrontation, and lost three and seven weeks of work, respectively, because of their behavior.

Dogs can develop long-lasting trauma when pain is used as a threat or as punishment. Even though the dog burned with cigarettes by his previous owner improved for about a year and a half, he became aggressive again while aging and never fully recovered from his fear.

The inconsistency of owner body language and the non-predictive behavior of the owner toward the dog can cause great damage during behavioural treatments (32%).

When pain-inducing methods were abandoned, success in treatments was close to 80%.

## **Discussion**

The biggest difficulty in therapy was to convince owners to abandon their previous habits and beliefs regarding punishment. In France, too many trainers are still using pain to deal with aggressive dogs—trying to “win” fights and to be “stronger” than the dogs. Such practice leads to statements like “women cannot deal with certain kinds of breed” or “this dog will always be the boss—he was born dominant.” We know these are not scientific statements. This study reflects the ongoing need for behavioural practices to educate owners about their dogs’ welfare and the negative effect of punishment on aggressive behavior.

## **Conclusion**

Using pain and reward at inappropriate times (or at the same time) are very traumatic experiences, which can increase aggressive disorders and keep dog from learning new, appropriate behaviours. This study demonstrates that non-painful

techniques can be successful in dealing with canine aggression directed toward family members.

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### **Keywords**

*aggression, dog, hierarchy, pain, punishment, status*

# The Prevention of Separation-Related Behaviour Problems in Dogs Re-homed from Rescue Centres

*E. Blackwell\*, R. A. Casey, J. W. S. Bradshaw*

## **Introduction**

Separation-related behaviour problems in dogs are categorised as unwanted behaviour that only occurs when the dog is separated from its owner. The most common behavioural signs are; destructive behaviour, often occurring near the site of the owner's most recent departure; various types of vocalisation; and inappropriate elimination (McCrave, 1991). Less frequent signs include excessive salivation, self mutilation, repetitive behaviour and vomiting.

One of the main differentiating features between separation-related behaviour and other behavioural disorders with similar signs, is that the separation reaction is displayed soon after the departure of the owner, normally commencing within 30 minutes, and often within the first few minutes (Voith and Borchelt, 1985). Although over-attachment to the owner, resulting in anxiety upon separation, is often assumed to be the main motivation for separation-related behaviour, there can be other causes, for example, a lack of habituation to separation from other individuals. In a significant proportion of cases the development of separation-related behaviour appears to involve a combination of factors (Blackwell et al., in press).

A large proportion of dogs are handed in to rescue organisations because they have displayed behaviours perceived as problematic to their owners. Where behaviour problems are given as a reason for handing dogs into rescue, it is estimated that 33% of these are related to separation (Bailey, 1992). In addition, the return of pets

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*University of Bristol, School of Clinical Veterinary Science, Langford,  
BS40 5DU, UK*

\*Corresponding author: [Emily.Blackwell@Bristol.ac.uk](mailto:Emily.Blackwell@Bristol.ac.uk)

homed through rescue centres also poses a significant problem. Of dogs re-homed by RSPCA, 16% are returned, 68% of which are returned due to problem behaviour (Ledger et al., 1995). Advice given to the new owner at the time of re-homing could reduce the likelihood of the dog developing separation-related behaviour, and thereby reduce the number of dogs returned to the shelter. In this study, we report on our development of a written programme of preventative advice for owners adopting dogs from rescue centres.

## **Material and Methods**

Three hundred and six dogs re-homed by the William and Patricia Venton RSPCA animal centre were included in the study. At the time of re-homing dogs were allocated alternately to two groups, experimental (treatment) and no treatment (control). Adopters of dogs in the treatment group received a generic programme of behavioural advice for the prevention of separation-related behaviours, designed to be implemented immediately upon collection of the dog. Adopters of dogs in the control group were given general advice about flea treatment and worming.

Efficacy of the advice was measured using information obtained from owner questionnaires. New owners were contacted by post 12 weeks after re-homing and asked to complete and return a questionnaire. They were required to report details of their dog's behaviour when left alone, as well as its behaviour when they were present. Questions were also included to examine the owner's compliance with the treatment advice.

## **Results**

Two hundred and seven owners returned questionnaires regarding their dogs' behaviour during the 12 weeks following re-homing. 14 dogs were excluded from further analysis as they were never left alone and the new owners were therefore unable to provide information about their dogs' behaviour when alone. A further 17 dogs were also excluded from the analysis as their owners had received additional behavioural advice from another source during the 12 week period. Data from 176 dogs was retained for further analysis.

Overall 30 percent of the re-homed dogs were reported to show separation-related behaviour in the new home. Owner compliance varied between different aspects of the advice.

### **Efficacy of advice**

The efficacy of the treatment advice was examined by comparing the incidence of separation-related behaviour following re-homing between the treatment and control groups. Significantly more dogs in the control group displayed separation-related be-



haviour in their new home (38%) than in the treatment group (22%) ( $X^2 = 3.888$ ;  $p = 0.049$ ;  $df = 1$ ).

## **Discussion**

The written behavioural advice programme appears to be effective in reducing the development of separation-related behaviour following re-homing, however, owner compliance was found to vary between different aspects of the advice. Further investigation is required to determine why this was the case. It may be that some parts of the advice, such as leaving the dog for gradually increasing periods, were more difficult to implement. Further investigation as to the reasons for this would be beneficial. It is possible that providing the advice verbally, in addition to written notes, may increase owner understanding and levels of compliance and this is worth further investigation. Telephone interviews, or video footage of the dogs when left alone in the new home, may provide more accurate information about separation-related behaviours, rather than reliance upon owners written reports.

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## **Keywords**

*attachment, bond, compliance, dog, separation*

# **Factors Influencing Stereotypical Behaviour Patterns in Horses: A Review of 52 Clinical Cases**

**R. A. Casey\***

## ***Introduction***

Behaviours such as weaving, box-walking and wind-sucking have traditionally been regarded as undesirable behaviours or “vices” by horse owners, but recent evidence suggests that such behaviours may develop as responses to sub-optimal environmental conditions (Nicol 1999) in those particular individuals that are genetically predisposed (Marsden and Henderson 1994). In particular diet and feeding practice (McGreevy et al. 2001), weaning strategies (Waters et al. 2002), and social isolation (Cooper et al. 2000) have been suggested as environmental factors important in the development of stereotypical behaviours in horses.

Previous perceptions that stereotypies were “vices” led to “treatment” regimes that aimed to physically prevent the performance of the behaviour rather than understand the underlying causes for it. McBride and Cuddeford (2001) found that physically preventing horses from performing these behaviours compromised their welfare. Epidemiological studies (e.g. Luescher et al. 1998) have started to change the perceptions of horse owners leading to the development of more welfare compatible treatment options.

In this study, a clinical population of horses presented with stereotypical behaviours is examined for relationships between presenting signs and historical and observational findings.

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*Anthrozoology Institute, Department of Clinical Veterinary Science,  
University of Bristol, Langford, Bristol, BS40 5BU, UK*

\*Corresponding author: Rachel.Casey@bristol.ac.uk

## **Materials and Methods**

The data for this study was collected from the case records of 52 clinical cases of equine stereotypies referred to a veterinary behaviour specialist by first opinion veterinary surgeons in the South of England between the years 1992 and 1998. Each horse was visited in its home environment for a behaviour consultation of between two and four hours, prior to which each owner was sent a questionnaire which included details of the specific problem behaviour, the signalment of the horse, the management system under which it was kept, and any information that was available about the history of the horse. During the consultation the horse was observed displaying the stereotypical behaviour where possible, or further information was obtained from owners as to the location, timing, and specific triggers for the problem behaviour. The following variables were extracted from the case questionnaires and reports: type of horse; age; sex; colour; purpose for which the horse was used; type of stereotypy; age of onset of stereotypy; and triggering stimulus for stereotypical behaviour to occur. The population consisted of 19 Thoroughbreds (TB), seven "Warmbloods", six "Coldbloods" 16 TB first crosses, and four Arabs or Anglo-Arabs. Twenty six of the horses were geldings, five entire males and 21 were mares, and the age range for the population was four to 17 years. Twenty four of the horses were kept as general riding horses, 10 were used exclusively for dressage, nine were used for eventing and / or show-jumping, and seven for racing or point-to-pointing. The relationship between the age of horses and other variables was examined using Kruskal-Wallis tests. All other variables were compared using chi-square tests.

## **Results**

Of the 52 horses, 17 were weaving, nine were crib-biters, three were windsucking, nine were box-walking, seven were head nodding, five were displaying stereotypical lip or tongue movements (including wall or door licking), and two were self mutilating. The self mutilating horses were excluded from further analysis because of the small number, and windsucking and crib-biting horses were combined into a single category. No significant relationship was found between type of stereotypy and sex, type of horse, purpose of horse, or colour. A significant relationship was found between type of stereotypy and age of onset ( $\chi^2 = 38.142$ , d.f. = 12,  $p < 0.01$ ), with a higher than expected count (40%) of lip and tongue movement stereotypies starting between one and three years of age, and 50 percent of crib-biting and wind-sucking starting at less than one year of age. Unfortunately, in the majority of cases ( $n = 37$ ), age of onset of the behaviour was unknown due to change of ownership. Age of onset was also related to the purpose for which the horse was kept, as those used for racing / point-to-point were more likely to have an age of onset less than one year of age, and less likely to have an unknown age of onset than those used for other purposes (d.f. = 9,  $p = 0.01$ ). This result needs to be viewed with some caution, however, as the age of the horse at the time of the consultation may be a con-

founding factor. Horses in the racing group were significantly younger at the time of consultation, and were hence less likely to have changed hands than the older horses in the other groups. In fact, age at time of consultation was found to be significantly related to age of onset (d.f. = 3,  $p < 0.01$ ).

A significant relationship was found, however, between presenting stereotypy and the factor identified as the primary trigger for the behaviour to occur ( $\chi^2 = 41.170$ , d.f. = 8,  $p < 0.01$ ). Stimuli identified as those responsible for triggering the stereotypy for each horse were simplified into three categories, which were: (i) Anticipatory; behaviour occurs with human activities causing the horse excitement, anticipation or frustration, such as preparing feeds, preparing to turn a horse out, tacking up for exercise, (ii) No stimuli; behaviour occurs in the apparent absence of triggering stimuli in the stable or whilst at grass, and (iii) Conspecific; behaviour occurs in response to activity of other horses, such as other horses passing the stable, or calling from out of visual contact. A higher than expected count of weaving horses (71%) were primarily triggered to show this behaviour with anticipatory triggers. Similarly, 92 percent of windsuckers did so with no apparent stimulus, and 56 percent of box-walkers displayed this behaviour with conspecific activity. Precipitating factor was not related to type, age, sex or purpose.

## **Discussion**

The results of this study suggest that the age of onset and triggering factors for stereotypical behaviour in horses vary with physical presentation. The earlier age of onset for crib-biting and windsucking than for other stereotypies is consistent with the findings of Waters et al. (2002) in their longitudinal study into the effect of weaning. In addition, the relationship of stereotypy type and triggering factor supports the findings of other authors, such as Cooper et al. (2000) in the hypothesis that the origin of these behaviours are not uniform, and involve different motivational states, stages of development and possibly different neuroanatomical and neurophysiological changes.

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**Keywords**

*horse, stereotypy, welfare*

# **Pseudopregnancy in the Bitch: An Epidemiological Study**

***P. Darder , J. López , J. F. Fatjó\*,  
J. L. Ruiz de la Torre , M. Amat , X. Manteca***

## ***Introduction***

Pseudopregnancy is a very common physiological condition in the bitch, which can involve physical as well as behavioural signs. Physical signs include mammary tumefaction and secretion, weight gain, dermatitis and abdominal contractions. Behavioural manifestations include nesting and maternal behaviour, apathy, lethargy, attention seeking, irritability and aggression (Gobello et al. 2001a).

Although the exact prevalence of this condition is not known, it is estimated that 50–70% of bitches could be affected (Johnston 1980). Pseudopregnancy is also found in wolves. In fact, some authors hypothesize that pseudopregnancy could be an adaptative response shown by non-breeding females to help with raising the offspring of the breeding female. From an evolutionary perspective, this strategy could be understood as a form of kin selection, since natural wolf packs are often composed of closely related individuals (Voith 1980).

Physiological studies indicate that the onset of pseudopregnancy is linked to a reduction of progesterone levels, together with an increase in the levels of prolactin (Concannon and Lein 1989).

Few studies have been conducted about the epidemiology of pseudopregnancy in the domestic dog. Further, most studies have been done with laboratory dogs, with little or no attention to possible influences of the domestic environment (Gobello et al. 2001b). In laboratory rodents, stress levels significantly decrease

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<sup>1</sup>*Clínica Veterinària GatiGos, Envelat 19, 43830, Torredembarra, Spain*

<sup>2</sup>*Departament de Fisiologia, Facultat de Veterinària, Universitat Autònoma de Barcelona, 08193, Bellaterra, Spain*

\*Corresponding author: jaume.fatjo@uab.es

plasma prolactin and progesterone levels as well as the length of pseudopregnancy (Morehead and Gala 1989).

This study was designed to characterize the clinical signs shown during pseudopregnancy, as well as the general behavioural profile of affected bitches. Also, the owner's attitude about the problem was evaluated.

### ***Material and Methods***

Seven hundred and fifty questionnaires were provided to owners of intact bitches through local veterinarians. The main inclusion criteria were bitches that were between 1 and 9 years of age, observation of pseudopregnancy signs in the past and the absence of any acute medical condition. Also, a control group of bitches was included in the study. As a result, 100 questionnaires were obtained from owners of pseudopregnant bitches, from which 60 were suitable for analysis, and 100 questionnaires were obtained from controls. Information collected included data about the animal's physical and social environmental, as well as a thorough description of the behaviour, both during and outside of the period of pseudopregnancy. Social aspects of behaviour were those receiving more attention, together with information about the animal's period of behavioural development. In addition, owners were asked about their attitudes about pseudopregnancy and what treatments were used to control it.

### ***Results***

Of the physical manifestations of pseudopregnancy, mammary tumefaction was observed in 78.6 percent and mammary secretion in 71.4 percent of bitches. Behavioural signs observed were nesting in 66.1 percent, maternal care in 53.6 percent and apathy in 46.4 percent of affected animals. More than 75 percent of bitches showed their first clinical pseudopregnancy episode either during their first oestrous or from the fifth on. Once presented, 67 percent of bitches showed recurrent episodes of pseudopregnancy. Up to 69.6 percent of bitches showed some form of aggression during the time when not experiencing pseudopregnancy. Phobias to inanimate stimuli and signs suggestive of separation anxiety were reported respectively by 44.6 percent and 25 percent of the owners. Drugs were administered to 41 percent of bitches, whereas a 58 percent did not receive any treatment.

### ***Discussion***

As other studies noted, our preliminary results suggest that mammary tumefaction is the most frequent symptom reported by owners, followed by mammary secretion (Johnston, 1986). The most common behaviour manifestation in our study was nesting, followed by apathy and maternal care. However, in other studies, nesting behaviour was considered a less common symptom, which usually goes unnoticed by

the owner (Johnston, 1986). Although above the level of significance, a slight correlation was found between signs of oestrus and signs of pseudopregnancy. In most cases, the onset of the problem occurred either after the first heat or after the fourth. These findings could indicate the existence of two populations of bitches and warrants more research. Separation anxiety and phobias were not especially frequent in bitches showing pseudopregnancy. Drug therapy was by far the treatment preferred by owners.

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## Keywords

*aggression, dog, maternal, pseudopregnancy*



# **Ethogram of Horses Experiencing a Standardized Handling Test with a Special Interest to Objective Assessment of Fearful Reactions**

***C. Falewée\*, E. Gaultier, D. Colombani, P. Pageat***

## ***Introduction***

Fear reactions are very common in horses. For most riders a fearful horse is easy to recognize: it shies very often, feels uncomfortable while alone, and isn't able to take advantage of its capacities at work. To evaluate horse behavior, some experimental tests are described in the bibliography such as open field, novel object, gregariousness situation, or subjective evaluation given by the usual rider of the animal (Mc Cann et al. 1988; Wolff et al. 1997; Visser et al. 2002; Visser et al. 2003). Behavioral scores are built from these tests and they give an evaluation of fearfulness or reactions during social separation. The major limit of these tests is their almost impossibility to be replicated in every day practice. The interest of easily managed and reproducible handling tests to evaluate fearfulness of horses has been demonstrated but no listing of behavioral patterns can be found (Wolff et al 1997; Visser et al 2002; Visser et al 2003). The test of the curtain described in this study will lead to list the typical behavioral items observed during a stressful situation.

## ***Materials and Methods***

### ***Subjects***

A population of 53 horses, all ages from three to 33, has been studied. All of them were housed under similar conditions in the same breeding farm. The group consisted of 47 Lusitanian horses, two French saddle-breds, two Merens pony breed,

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*Phérosynthèse, Research Center, Le Rieu Neuf, Saint Saturnin les Apt  
84490 France*

\*Corresponding author: [chfalewee@yahoo.com](mailto:chfalewee@yahoo.com)

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one pony and one Ardennes horse breed. The great majority of Lusitanian horses involved a high number of stallions (32), compared with geldings (7) and mares (14).

## Methods

Horses were all video-taped while submitted to an experimental stressful situation. The test combined neophobia (new object) and handling situation: the owner led the horse through a fringed curtain to enter the grooming area. After 450 seconds the deadline is over and the test is “failed”. Two groups have been determined:

The 20 best performers: these horses (17 Lusitanians, 1 Merens, 1 Ardennes horse and 1 French saddle-bred; 13 stallions, 3 geldings and 4 mares) went through the curtain between 12 and 136 seconds.

The 20 worst performers: these horses (18 Lusitanians, 1 Merens, and 1 French saddle-bred; 10 stallions, 2 geldings and 8 mares) went through the curtain between 189 and 419 seconds.

Videos of the 20 worst performers and videos of the 20 best performers have been analyzed. Behavioral patterns that frequently occurred and attitude of the horse and its gait (see table 1) were assessed. For each behavioral item, percentage of horses of each group having performed it, frequency (number of occurrence / min), relative duration (percent of time spent doing this item) and mean duration (s) have been evaluated. Some patterns have been performed very punctually, so for them, only the two first parameters have been assessed. Frequency and mean duration have been compared using a non-parametric analysis (Man-Whitney U-test).

Table 1. Studied behavioral patterns

Head and neck		Others	
MH	up	HE	neigh
MHB	up and down	SOUFF	air expired with force by the nostrils
MCOT	to the sides		
MS	toward the stimulus	SS	involuntary jump
S	head shaking	DEF	defecation
EAV	neck far forward	OTD	ears very mobile
		OS	ears toward the stimulus
		OAR	ears back

<b>Movements</b>		<b>Legs</b>	
DER	run out	JR	legs under the horse
PIET	stamping	RU	kick
MCRB	walking sideways	FS	kick the ground
PB	small jump	ATT	trembling hind-quarters
SAU	jump	DP	straight legs glued to the ground
A	stop	PC	body weight on the hind-quarters
P	walk	PAV	body weight on the forelegs
REC	go back	CAB	rearing
T	trot		
G	fast acceleration		
CHALL	gait changes		
		<b>Tail</b>	
		QPC	plastered on the rump
		MC	moves towards the flanks
		LL	lightly up

## Results

Videotape analysis gave two kinds of results: a “mean description” of the more frequent behaviors performed by horses of each group, and a classification of patterns from “very typical of fear” to “very typical of relax.”

Best performers showed signs of exploration such as ears quiet and orientated toward the curtain, head movements in the same direction, they also sniffed the new object and moved straight ahead in slow gaits (walk, slow trot).

Worst performers, considered as more fearful horses, showed an elevated posture of the forehead with all the weight on the hind-legs, they had very mobile ears preferentially orientated toward their back and a tail placed between hind-legs. Gaits they generally used were, either fast and ahead, or were going backward. Punctual events correlated with these horses were hesitations, snorts, pawing, swerves, defecations and stamping around (passage or prancing).

Behavioral patterns could be divided into seven categories according to the number of individuals presenting the considered item, its frequency and its mean duration:

- Items very typical of fear to be included in this category should fulfill five criteria:
  - observed by less than 25 percent of the good performers group
  - observed by more than 75 percent in the worst performers group
  - significantly expressed more frequently the worst performers group

- significantly more time spent doing this item the worst performers group
  - mean duration significantly longer the worst performers group  
This group contains the following items: DER, PIET, G, and ATT.
  - Items characteristic of fear but rarely observed answered one criterion:
    - observed in less than 5 percent of the good performers group but occurred in the worst performers group  
This group contains the following items: PB, QPC, SOUFF, DEF, JR, and CAB.
  - Items relatively more observed when fear occurred answered three criteria:
    - significantly expressed more frequently in the worst performers group
    - significantly more time spent doing this item the worst performers group
    - mean duration significantly longer the worst performers group (when exists)  
This group contains the following items: MCRB, REC and MB.
  - Longer emitted items when fear occurred answered two criteria:
    - significantly more time spent doing this item the worst performers group
    - mean duration significantly longer in the worst performers group  
This group contains the following items: A, PC, OAR and OTD.
  - No link found with fear answered one criterion:
    - No difference observed between the two groups  
This group contains the following items: CHALL, MH, MHB, EAV, MCOT, MC, S, SAU, HE, SS, T, RU, FS, DP, PAV, LL
  - Items relatively more observed when horses are quiet answered three criteria:
    - significantly expressed more frequently in the best performers group
    - significantly more time spent doing this items in the best performers group
    - mean duration significantly longer in the best performers group (when exists)  
This group contains the following items: P and OS
- Items typical of calm but rarely observed answered one criterion:
- observed in less than five percent of the worst performers group but occurred in the best performers group  
This group contains the following item: MS.

## Discussion

Among the behavioral patterns here found as “characteristic of fear” (first three categories) we encountered items generally quoted as representative of fear (Kiley-Worthington 1999; Mills and Nankervis 1999; Leblanc and Bouissou 2003; Mc Greevy 2004). However, patterns considered as “characteristic of fear” in this test are inherent in the experiment conditions (handling situation, human intervention) and consequently cannot be generalized to other tests (Wolff et al. 1997). That’s also why results differ from those of open-field situations, particularly for gait changes classified in this test as “no link found with fear” (Mc Cann et al. 1988, Visser et al. 2003).

Horses’ reactions must always be interpreted with the conflict of motivation presented to the animal.

It could be possible to translate these items in numeric values so as to obtain a behavioral score for each horse. Further investigation should lead to a validation of such a table of interest to riders or veterinarians.

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## Keywords

*ethogram, fear, handling, horse*

# Aggression in Dogs: Analysis of 761 Cases

**J. Fatjó\*, M. Amat, V. Mariotti,  
J. L. Ruiz de la Torre, X. Manteca**

## **Introduction**

Canine aggression is considered a serious public health problem, which affects millions of people every year. Children under 9 years are more frequently involved in these incidents and suffer more severe lesions than adults (Weiss et al. 1998). Also, aggression problems can be considered an important risk factor for euthanasia and relinquishment of dogs to animal shelters (Patronek et al. 1996; Stead 1982).

In a study conducted in the United States, more than 40 percent of dog and cat owners reported that their pets engaged in one or more behaviour problem (Voith 1981). In the United Kingdom, a survey conducted of 50 dog owners reported inappropriate behaviours in 80 percent of the animals (O'Farrell 1992).

Among behaviour problems, aggression seems to be a highly ranked, if not the most common, complaint seen by small animal behaviourists. One of the most comprehensive epidemiological studies was conducted at the Small Animal Clinic at the University of Pennsylvania from 1905 telephone calls regarding canine behaviour problems. They found aggression to be the most frequent problem reported in dogs (Borchelt and Voith 1996). Data from other studies shows that aggression is invariably reported the most frequent complain about canine behaviour, from 42 percent to 59 percent of all cases seen by small animal behaviourists (Beaver 1999; Overall 1997).

Canine aggression targeted towards people is the most common type of canine aggression cases seen by small animal behaviourists (Borchelt and Voith 1996). The most frequent diagnosis is dominance-related aggression, followed by fear-related aggression and territorial aggression (Landsberg 1991).

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*Universitat Autònoma de Barcelona, 08193, Bellaterra, Spain*

\*Corresponding author: jaume.fatjo@uab.es

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Male dogs are involved in more cases than female dogs (Lockwood 1995). Conclusions from studies about breed predisposition yield inconclusive results (Mertens 2002).

To the authors' knowledge, there are no extensive studies about the long term outcome of dogs treated for aggression. Treatment seem to reduce aggression in most cases, but only a small percentage of patients show a complete and sustained remission of aggressive signs (Line 1986). Some epidemiological risk factors have been associated with certain forms of aggression in dogs, like the size of the dog and the unpredictability of the attacks (Reisner et al. 1994).

This study was designed to evaluate the epidemiological characteristics of 761 cases of canine aggression.

### **Materials and Methods**

A retrospective study of 761 cases of aggression towards people or other dogs presented at the animal behavior clinic of the Barcelona School of Veterinary Medicine was performed. Data was primarily obtained from history forms. In addition, we conducted a telephone survey to obtain long-term follow-up from 100 owners. In order to be included in this group, dogs must have undergone treatment for at least 6 months.

SPSS© 10.0 for windows (SPSS Inc., Chicago) was used for statistical analysis.

### **Results**

Of the behaviour cases presented to the Barcelona School of Veterinary Medicine, aggression towards people was the most frequent owner's complaint (67.9%), of which 39 percent was directed to family members. Cases involved aggression towards other dogs as a main complain was 32.1 percent of the cases reported. The most common diagnoses were competitive/social conflict aggression towards human family members (47.8%), hierarchical conflicts between dogs (22.7%), fear-related aggression (11.2%) and intra-sexual aggression (9.6%). More than two thirds of the dogs exhibit more than one form of aggression.

Males represented more than 69 percent of all cases and only 7.4 percent of them were neutered. In all diagnostic categories, males were found to be more aggressive than females. Breeds more frequently involved were German Shepherds (18.8%), English Cocker Spaniels (13.6%) and terriers (8.4%). Looking at individual types of aggression, certain breeds seem to be overrepresented in certain forms of aggression. When examining all the cases of aggression towards family members involving purebred dogs, 13.6% of them were cockers, whereas the estimated percentage of the breed in the general population in the sample area is lower than 5 percent.

From the 100 dogs surveyed for long term follow-up, more than 75 percent showed different degrees of improvement, whereas 25 percent did not show any progress. Fourteen percent of dogs underwent euthanasia. The most common factors related to euthanasia were aggression towards familiar people (87%), the presence of small children (44%) and the occurrence of impulsivity (44%).

A negative prognosis (euthanasia) was statistically higher for dogs that had showed the problem from 12 to 24 months. Treatment of those dogs that displayed aggression for less than 1 year and for more than 2 years had a better outcome.

## **Discussion**

Most of our data regarding the most frequent target of aggression and the most common diagnosis is in agreement with other studies (Beaver 1999; Borchelt and Voith 1996; Landsberg 1991). Also in agreement was the finding of male dogs over-represented in the population of dogs displaying aggression.

In our study, the English Cocker Spaniel, especially in the golden coat color, was significantly overrepresented in those cases of aggression directed towards family people as compared to the population.

Dogs that had showed aggression for more than 12 and less than 24 months showed poorer prognosis than the rest. Dogs that showed aggression during less time could benefit from an early diagnosis and treatment. For dogs that had showed aggression for a long time, better prognosis could be linked to a higher level of owners' tolerance of the problem.

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**Keywords**

*aggression, bite, dog*

# The Tragedy of a Quick-Fix Approach to Canine Behaviour Problems: A New Zealand Perspective

**E. L. Flint\***

## **Introduction**

Today's society is increasingly based on a fast pace of life; long working hours, close living, high stress levels and a self centered attitude. Tolerance levels are reduced in these conditions and problems must be rapidly solved with minimum effort or the cause removed. Unfortunately our pets, in particular our dogs, are suffering as a result of these social conditions. Often purchased to fill an emotional void in their owners' lives or as possessions or playthings they are expected to survive with insufficient companionship, exercise and mental stimulation. When "behaviour problems" arise as a result, society demands a quick-fix approach, which in many cases results in needless trauma and suffering and in some cases even death.

Barking is possibly the least well tolerated canine behaviour. Neighbours are quick to complain if dogs are barking and the dog control service is equally quick to respond by uplifting the dogs or imposing heavy fines. On occasion they offer "advice" to owners. All too often this advice is simply to purchase an electric dog collar. There is little attempt to assess the actual level of barking or to ascertain any possible cause. A review of cases studies from the author's behaviour clinic elaborates on the inappropriateness of this approach which results all too often in dogs suffering from anxiety based disorders remaining undiagnosed and being subjected to shock collars. Treatment and modification methods are reviewed.

A study was undertaken to establish a normal barking level against which complaints may be measured in the first instance to ascertain if in fact a problem exists. It was also designed to evaluate the most common triggers for barking in suburban dogs.

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*Animals with Attitude behaviour clinic, 1 Ewen Alison Avenue, Devonport, Auckland, New Zealand*

\*Corresponding author: e.flint@gmx.net

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## **Materials and Methods**

One hundred dogs were randomly selected from three small animal veterinary practices. Dogs were between six months and 12 years of age, all in good health and with no history of barking problems. All dogs had to receive at least 30 minutes' exercise morning and night. Owners were supplied with a questionnaire to record frequency, intensity, duration of and triggers for barking episodes in their dogs over seven 24 hour periods. Environmental conditions were also recorded. The owners were then supplied with voice activated tape recorders to record barking over seven 6–8 hour periods when they were not at home.

## **Results**

On average dogs reportedly bark 3.1 times in 24 hours when owners are at home (Max: 8; Min: 0). Average duration of each episode is 50.88 seconds (Max: 302; Min: 1). The average total bark time over 24 hours is 198 seconds (Range 0–430). Triggers for barking in order of frequency include: presence of strangers near the property; visitors arriving; interaction with owners (greeting, seeking attention, pre walk or pre ride excitement); sudden unfamiliar noises; presence of non resident cats on or near the property; other dogs barking; presence of a strange dog near the property; interaction with the resident cat.

## **Discussion and Conclusion**

The completed study will establish a norm that should be tolerated as an acceptable level of barking. We have maximum acceptable levels for other noise in society such as music from parties, car racing etc. However there is no accepted normal level for barking. Assessment is subjective and dog owners are at the mercy of intolerant neighbours. It is intended that establishing an acceptable normal level of barking in suburban dogs will prevent the abusive practice of subjecting dogs to electric collars to extinguish what is a normal and important canine behaviour. It is hoped that where barking is identified as outside the norm owners will be alerted to the need for proper assessment of and treatment for the problem. Knowing the most common triggers for barking could help concerned owners institute appropriate environmental modification that may decrease barking frequency where this is of concern to them or their immediate neighbours.

## **Keywords**

*barking, control, dog, measurement, trigger*

# **Influence of a Putative Appeasing Pheromone on Behaviour of Broilers: A Tool for a Better Understanding of Behaviour—Preliminary Results**

***I. Madec<sup>1\*</sup>, J. F. Gabarrou<sup>2</sup>, D. Saffray<sup>1</sup>, C. Lafont<sup>1</sup>, M. A. Gervasoni<sup>3</sup>, A. Bollart<sup>4</sup>, P. Pageat<sup>1</sup>***

## ***Introduction***

In poultry, behavioural parameters related to stress have been extensively studied. Ethograms have been described, including many parameters, either in relation to welfare (Maria et al. 2004) or to pure behaviour (Roden and Wechsler 1997). Most of these results come from small scale studies and they are time consuming (Campo et al. 2000). It would be of interest to have criterion that characterize stress related behaviours in classical husbandries, considering the large number of animals in these situations. Correlations exist between behaviour in response to stress and physiological or performance parameters. This study addresses the most probable parameters that may be related to stress in order to build a scale including the most representative stress behaviours. An odorant analogue has been isolated on hens having chicks in natural conditions. Because it is chemically comparable to known pheromones, we may suppose it is a pheromone (putative). The starting hypothesis is that the pheromone analogue (called HOA for Hens' Odorant Analogue) has an appeasing effect on chicks and that the impact of stress should be lower in treated chicks when

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<sup>1</sup>*Phérosynthèse, Le Rieu Neuf, 84490 Saint Saturnin Apt, France*

<sup>2</sup>*ESA Purpan, 75 voie du TOEC, 31076 Toulouse, France*

<sup>3</sup>*ENV Nantes, BP 40707, 44307 Nantes, France*

<sup>4</sup>*ENV Lyon, 69280 Marcy l'Etoile, France*

\*Corresponding author: imadec@wanadoo.fr

compared to chicks that are not under HOA treatment. This could become a helpful tool to compare the level of and consequences of stress.

## **Materials and Methods**

There were two buildings in the study. They were identical (400m<sup>2</sup>, 4400 birds in both). Each one received a treatment: placebo (P) or HOA. The HOA was provided by the manufacturer in a slow releasing block. Each block contained 2% HOA. The treatment started on the day previous to the arrival of the animals (D0). Individual weights were recorded every 10 days (n = 400). On day 79 (D79), blood samples were obtained from the wing vein for cortisol (CS) and heterophil/lymphocyte ratio (HLR) calculation (n = 200). In addition, the final live weight was taken. On day 80 (D80), the broilers were slaughtered. Carcasses (n = 80) were dissected at 24 h post mortem. After dead weight, pectoralis major weights were measured as well as abdominal fat weight. After excision and weighing, muscle pH was recorded with a pH meter. Colour (L: lightness, a: redness and b: yellowness) was measured on the posterior area of the ventral side of the fillets. At D86, the pectoralis major muscle were further analysed. At this stage, weight, pH and colour were recorded. A sample of the pectoralis major muscle (n = 80) were analysed for weight, pH and colour before and after cooking.

## **Results**

Only significant results are reported here. For each analysis, differences have been done between placebo and HOA, for each parameter considering males, females and males + females. Outcomes were divided into three types. The first, concerns blood parameters (24 hours ante mortem). CS measurements showed a higher rate for males in the control group (HOA < P, t-test,  $t = -2.02$ , 50 d.f.  $p < 0.05$ ) whereas HLRs showed no difference between treatments. The second concerns 24 hours post mortem parameters. Differences were found for males: carcass and fillet weights were heavier for treated animals. Yellowness and pH were higher in the control group (Table 1). The third group concerns data at six days post mortem (Table 2). Concerning fillets, pH of treated animals were higher and their yellowness was lower. Observing meat samples, cook loss was higher for the control group. The loss in fillets' weight from 24 hours to six days post mortem was lower for males from the treated group (Wilcoxon test,  $z = 2.77$ , 38 d.f.  $p < 0.001$ ). Finally, redness and yellowness were lower for treated animals (concerning samples).

Table 1. Results at 24 hours post-mortem—Males

Parameter	Difference <sup>(1) (2)</sup>	Statistics <sup>(3)</sup>
Carcass weight	HOA>P*	t = 2.70, 38 d.f.
Fillet weight	P<HOA*	t = 2.07, 38 d.f.
b	HOA<P*	t = 2.49, 38 d.f.
pH	HOA<P*	z = 2.54, 72 d.f.

Notes: (1) quantitative data – (2) \*p<0.05, \*\*p<0.001, \*\*\*p<0.0001 – (3) t-test or Wilcoxon test

Table 2. Results at six days post-mortem

Body part	Parameter	Sex	Difference <sup>(1) (2)</sup>	Statistics <sup>(3)</sup>
Fillet	pH	Males	P<HOA**	z = 2.91, 38 d.f.
	pH	Males + Females	P<HOA*	z = 2.36, 72 d.f.
	b	Males + Females	HOA<P*	t = -2.26, 72 d.f.
Pre-cooking sample	a	Males	HOA<P**	t = -2.72, 38 d.f.
	b	Males	HOA<P***	t = -4.84, 38 d.f.
	a	Males + Females	HOA<P*	t = -2.21, 72 d.f.
	b	Males + Females	HOA<P***	t = -4.27, 72 d.f.
Weight loss	Pre/Post-cook	Males	P<HOA*	z = 2.02, 38 d.f.
	Pre/Post-cook	Males + Females	P<HOA*	z = 2.10, 72 d.f.

Notes: (1) quantitative data – (2) \*p<0.05, \*\*p<0.001, \*\*\*p<0.0001 – (3) t-test or Wilcoxon test

## Discussion

It has been shown that CS level is connected with feather picking (Buitenhuis et al. 2002), which represents a stressful event for the bird in the long run. This is consistent with our findings, showing a higher CS level in the control group for males. This may also indicate that chickens under HOA spend more time exploring than fighting (Roden and Wechsler 1997). Results are not significant concerning the HLR, which may be due to the studied breed (Campo et al. 2000). The fact that no differences have been observed concerning live weights, lead to the question of observing Feed to Gain Ratio (FGR) in further studies, because we have observed some differences in carcass weights. Indeed, it has been shown that an over activity (consecutive to stress) leads to a bad FGR, due to a higher catabolism (Zulfiki 2002). To the same extent observing meat leanness instead of only abdominal fat will be a matter of concern for further analysis, because stress behaviour is related to

poor carcass quality (Siegel 1995). Weighing organs may also be a good indicator (Pulvadolpirod and Thaxton 2000). Results concerning meat colour measurements are in accordance with previous findings which concluded that lightness (L) can be altered in cases of prior slaughter stress (Fletcher 1999). Indeed, in our experiment, none of the study groups was under treatment after leaving the buildings, thus prior to slaughter. On the contrary, Ngoka et al. (1982) found that stress leads to low pH, correlated with high pigmentation and lower water holding capacity during life. We have comparable findings concerning samples: lower pH, high both redness and yellowness, and higher water loss post mortem. The fact that these findings are more impressive for samples compared to plain filets is probably due to working conditions (studying was easier in the lab compared to the slaughter plant). Because some authors (Alvarado et al. 2002) indicate that Pale Soft Exudative (PSE) meat does exist in turkey, our first results concerning meat quality (in particular water holding capacity) have to be considered carefully. Moreover, as shown by Petracci and Fletecher (2002), the time at which colour samples are studied is of importance due to dramatic changes within the first hours post slaughter. Results of the present study tend to show that males react in greater proportion compared to females. These differences need to be studied deeper to see if they are reproducible. Finally, aiming to have a relationship between performances and physiological parameters and behaviour, it would be interesting to look at both parameters that have been studied here and observations (video recording) of chickens' behaviour.

## Conclusion

In this study, we showed that the studied putative pheromone may have some influences on the behaviour of broilers, housed in a classical industrial breeding plant. This study can be considered as the starting point for building a scale that would allow dedicated persons to have a quick overview of the level of stress of their husbandry.

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**Keywords**

*behaviour, housing, husbandry, pheromone, poultry, stress*



# **A Comparison of Canine Behavior in Pre-adoptive and Post-adoptive Homes**

**A. R. Marder\*, M. VanDriel, J. Engel**

## ***Introduction***

Animal shelters have the task of evaluating canine behavior both to determine which dogs are suitable for adoption and which homes would be the best match for individual dogs. The methods used include the acquisition of behavioral history in the previous home, behavioral tests while the dog is sheltered, and general observation of the dog by staff and volunteers. Many shelters have relied upon behavioral tests to make adoption decisions while downplaying the importance of the behavioral history, mostly due to staff concerns about accuracy of reported information.

The present study was undertaken to assess the value of the behavioral history in determining future behavior by comparing reported information about behavior in pre-adoptive and post-adoptive homes.

## ***Materials and Methods***

A 38-item questionnaire was completed by each surrender upon relinquishment of a dog to the Animal Rescue League of Boston. Questions pertained to behavior toward familiar and unfamiliar adults and children, reaction to dogs and cats, response to handling, house soiling, destruction, barking, behavior when alone, and resource guarding.

Three to nine months after the dog was rehomed, the same questionnaire was administered by phone to a member of the dog's new family. Using the kappa test, behaviors reported by the surrenders were compared to behaviors reported by the adopters.

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*Behavior Department, Animal Rescue League of Boston, Boston, Massachusetts, USA*

\*Corresponding author: [amarder@arlboston.org](mailto:amarder@arlboston.org)

## **Results**

Preliminary results ( $n = 30$ ) indicate that pre-adoptive behavior in the surrenderer's home is moderately to substantially consistent with post-adoptive behavior ( $kappa > 0.4$ ) in the following categories: aggression to adults, behavior when alone, barking and house soiling. Data collection is ongoing.

## **Conclusion**

Many behaviors that occur in previous homes recur in adoptive homes. The acquisition of a behavioral history from surrenderers will make it easier for shelter staff to predict behavior and therefore better enable staff to make adoptability and matching decisions. Using the history, staff can also educate adopters about which behaviors to expect, and what to do about them, thereby increasing chances for retention. Furthermore, a questionnaire administered on intake takes little time and costs very little when compared with the time and training it takes to administer a behavioral evaluation (or temperament test).

## **Keywords**

*behaviour, dog, rescue, shelter*

# Perception of Veterinarians and Dog Professionals about Behavioural Characteristics of Pure-Bred Dogs (*Canis familiaris*) in Italy: Comparison with the U.S. and U.K.

L. Notari<sup>1\*</sup>, D. Goodwin<sup>2</sup>

## Introduction

In the dog *Canis familiaris* it is possible to observe great differences as far as size, conformation and pelage, but all breeds share the main part of their behavioural repertoire: they are sociable, gregarious, cooperative animals. The domestication process generated more docile animals, with a tolerance to closeness and handling on the part of human beings that is significantly higher in respect to their ancestors, the wolves (Clutton-Brock 1977; Clutton-Brock 1996).

Breeds were probably created because dogs had to be able to reliably perform particular activities or be predisposed to be trained for particular tasks. In modern western society the practical functions of dogs have progressively lost their importance, and their behaviour as companion animals is now more relevant in the human-animal relationship. Furthermore, other selection criteria that give more importance to physical conformation have started to gain more importance (Serpell 1995). The modality and intensity of the expression of genetic behavioural attitudes depends on learning and on the contextual situation and it is important to consider that the working context is completely different from household context. In this poster are showed the results of a study that gathered information about purebred dog behavioural traits in Italy through the opinions of dog professionals, because they have

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<sup>1</sup>Via Donatello 6, 21100 Varese, Italy

<sup>2</sup>University of Southampton, School of Psychology, Animal Behaviour Programme New College Campus, Southampton, SO17 1BG, UK

\*Corresponding author: lorellanotari@spazioaperto.net

daily contact both with animals and their owners. One of the purposes of the present study was to compare—as far as possible, considering that the distribution of breeds is different in different countries—the results with those of the survey conducted in the UK by Bradshaw et al. (1996) and the survey conducted by Hart and Hart in the USA (1983).

### **Materials and Methods**

One hundred and sixty-eight questionnaires were included in the analysis and the respondents were 56 veterinarians from the north of Italy, 56 veterinarians from the south of Italy and 56 dog experts, non-veterinarians. Forty-nine dog breeds were selected. The breeds were divided into seven breeds per respondent by using the same method used by Bradshaw et al. (1996).

The questionnaires were composed of the same questions as in the UK survey. The thirteen questions regarded behavioural traits that are were about the following traits:

- excitability
- watchdog behaviour
- snapping at children
- playfulness
- aggression towards other dogs
- general activity
- obedience training
- excessive barking
- dominance over the owner
- destructiveness
- demand for affection
- ease of housetraining
- territorial defence

The respondents were asked to rank the seven breeds from the one that showed the lowest level of expression of the described trait to the one that expressed it at the highest level. In the questions regarding obedience training and housetraining the respondents were asked to rank the breeds from the easiest to the most difficult to train. Respondents were also asked to compare male and female behaviours. The statistical methods used in order to interpret the collected data were the same as the ones used in the study by Bradshaw et al. (1996).

### **Results**

The differences between the behaviours of the sexes were all found to be significant except for playfulness and general activity. The analysis of variance showed that there was a significant difference among breeds and so all the 13 questions were

combined using principal factor analysis with varimax rotation to identify underlying behavioural traits.

It was decided to exclude the two questions in the final factor analysis: obedience training and house training. Two principal factors, labelled Aggressivity and Reactivity/Immaturity were found. The two factors accounted for 56.676% of the total variance. Nine hypothetical combinations of behavioural characteristics were formed. These grouping had similarities with the groupings presented in the USA and UK studies.

## **Discussion and Conclusions**

The greater total variance explained in previous studies in the U.S. and UK (88% of the total variance) could be explained by a more homogeneous evaluation of behavioural characteristics of breeds on the part of the respondents or by a more ingrained stereotyped image of breeds. The main advantage of surveys based on opinions is the collection of data about every-day behaviours and not just about field-testing sessions. When the study subjects are companion animals, the possibility to obtain information is ethologically more interesting, more complete as far as the range of behaviours that can be observed and reported is concerned, and less at risk of endangering the welfare of the animals studied.

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## **Keywords**

*behaviour, breed, dog*

# **Combined Use of Selegiline and Behaviour Modifications in the Treatment of Cases in Which Fear and Phobias Are Involved: A Review of Four Cases**

***L. Notari\****

## ***Introduction***

The cure of behaviour problems requires a thorough knowledge of neurophysiology and neuropharmacology, ethology and learning theory, along with an accurate evaluation of the available resources such as owner's possibilities and environmental features.

The use of drugs in behaviour therapy should enhance the possibility of modifying the behaviour which means that it should improve the capability of learning.

From this perspective, Selegiline is a particular drug that has been demonstrated to influence training performance, learning and memory (Mills 2001).

## ***Subjects and Methods***

The cases described below have been presented with different undesired behaviours but all the dogs had social and sound phobias, probably related to insufficient habituation and socialisation during the first months of age (Serpell and Jargoe 1995).

All the dogs were adopted from shelters or kennels.

### **Case one: Blu**

Blu is a two year-old spayed female crossbreed. She was adopted from a shelter two months before the date of the first behavioural consultation. The behavioural com-

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*Via Donatello 6, 21100 Varese, Italy*

\*Corresponding author: [lorellanotari@spazioaperto.net](mailto:lorellanotari@spazioaperto.net)

plaint was destructiveness when left alone: the dog destroyed the front door and a front window in an attempt to enter the house.

Other behavioural symptoms complained about were avoidance behaviours in response to human approaches and fear of noises and thunderstorms.

### **Case two: Leo**

Leo is a five year-old male crossbreed. He was adopted from a shelter one month before the date of the first behavioural consultation. The behavioural complaint was fear of thunderstorms: in the presence of thunderstorms the dog was completely out of control, jumping on furniture, trying to escape from the door or windows and causing damage and huge distress to the owners. Other behavioural symptoms complained about were avoidance behaviours to human approaches and fear of noises.

### **Case three: Molly**

Molly is an eight year-old lagotto romagnolo. She was adopted from the breeder kennel five months before the date of the first behavioural consultation. Molly was kept with the breeder till she was no longer able to breed. The behavioural complaint was an obsessive scratching of the owners' bodies when they were in bed. Other behavioural complaints were fear of noises, thunderstorms and fireworks and avoidance of unknown human beings, especially females.

### **Case four: Camilla**

Camilla is a five-month-old female crossbreed. She was adopted from a shelter when she was four months old, 1 month before the date of the first behavioural consultation. The behaviour complained about was fear of contact with human beings. Other behaviours complained about were fear of household noises and fear of cars and traffic sounds in general.

All cases were treated with Selegiline (Selgian) at a dosage of 0.5 mg/kg per day for a period of, respectively, six months (cases one and two), five months (case three) and three months (case four). Behavioural modifications were based on desensitisation and counter-conditioning techniques, use of environmental signals in order to enhance predictability of events, social facilitations to human approaches by involving other human-friendly dogs, improvements of dog-owner communication through instructions about dog language and dog social and behavioural needs (Buton and King 1983, Rogerson 1997, Liebermann 1999).

Thunderstorm and fireworks phobias (cases one, two and three) were treated also with a combination of propranolol (2.5 mg/kg) and Alprazolam (0.05 mg/kg) given "una tantum" whenever fireworks or thunder were likely to happen.

## Results

A single dose of the combination of the two drugs was effective since the first events, along with modification of owners' behaviours.

After three months all cases were improved as far as the undesirable behaviours were concerned.

In all the described behavioural cases the combined use of drug therapy and behavioural modifications led to long-term improvement.

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## Keywords

*behaviour, dog, phobia, selegiline, therapy*



# Use of a Synthetic Analogue of a Dog-appeasing Pheromone in Sheltered Dogs after Adoption

**M. C. Osella<sup>1\*</sup>, L. Bergamasco<sup>2</sup>, F. Costa<sup>3</sup>**

## **Introduction**

According to current Italian laws (L. 281, 14.08.1991) feral dogs wandering and/or directly delivered to the rescue associations can't be put to sleep, but they should be kept in adequate facilities until they are adopted by new families or they come to death (with the exception of severe illnesses or justified dangerousness when euthanasia might be authorized). Therefore the psychosocial conditions of life might be very peculiar for the dogs: for long-term management the limitations connected to a few spaces available, a reduction both in the human-animal and in the intra-dog interaction, a modification in the physiological and behavioural homeostasis might be crucial; for puppies and youngest even a short lifespan in the shelters might be very important because of the very delicate phase of their psychosomatic growth.

Consequently the adaptation to the new socio-environment after re-homing might actually be a very hard step for sheltered dogs, and the adoption time itself might be very difficult for the animals, which probably have already been emotionally compromised both for their background and the permanence in the shelters. Nevertheless it should be considered that the most effective way to improve welfare of a sheltered dog is to ensure that the animal is adopted, although the animal behaviour after the introduction in the family can determine whether or not the animal will

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<sup>1</sup>*Dipartimento di Patologia Animale, Sezione di Clinica Medica, Facoltà di Medicina Veterinaria, Università degli Studi di Torino, Via Leonardo da Vinci 44, 10095 Grugliasco, Italy*

<sup>2,3</sup>*Dipartimento di Morfofisiologia Veterinaria, Sezione di Fisiologia ed. Etologia, Facoltà di Medicina Veterinaria, Università degli Studi di Torino, Via Leonardo da Vinci, 10095 Grugliasco, Italy*

\*Corresponding author: osellamc@aliceposta.it

be regarded as desirable by the owners; one of the main problem for rescue associations is actually the high rate of dogs returned to the shelter after adoption.

The aim of this study was to explore the use of a synthetic analogue of a dog appeasing pheromone (DAP<sup>®</sup>, Ceva Santé Animale S.A., Libourne, France) in dogs re-homed from rescue shelters; the study design was a prospective open-label clinical trial.

## **Materials and Methods**

The dogs were recruited among the animals housed in a metropolitan private animal shelter, males and females, all breeds and mixbreeds, divided in two groups according to their age (puppies: 2 months–6 months; adults: 6 months and older).

Exclusion criteria were abnormal behaviours and severe emotional disturbances reported in the history or directly observed in the facility (Wells and Hepper 1992), primary organ failure and neurological signs, presence in the shelter for less than 2 months for adults; validated behavioural tests were performed for preliminary overall assessment (Van der Borg et al. 1991; Wilsson 1997).

At adoption  $V_0$  a diffuser with DAP<sup>®</sup> was given to the owners who agreed to participate to the study; they were briefed verbally about the procedure but no behavioural consultations were given throughout the study time.

At  $V_1$  ( $28 \pm 3$  days) and  $V_2$  ( $56 \pm 3$  days) the owners were interviewed during a control visit in the shelter, while between  $V_0$  and  $V_1$  the questionnaire was filled out by the investigator through telephone conversations at  $T_1$ ,  $T_2$  and  $T_3$ , that is after 7, 14 and 21 days.

At  $V_2$  the diffuser was stopped. During the visit or the telephone conversations the investigator referred to a checklists of behaviours and asked the owners to rate the frequency of each question on a five point frequency scale (never, rarely, sometimes, often, always) besides a rating of each category of signs on a five point change scale (much better, slightly better, the same, slightly worse, much worse) and an overall assessment including all the signs on a four point change scale (Improved, resolved, unchanged, worse); the owners were also asked at  $V_1$  and  $V_2$  to rate their satisfaction with the treatment using a four point degree scale (very satisfied, satisfied, dissatisfied, mainly dissatisfied) (Sheppard and Mills 2003).

## **Results**

To date fifteen dogs were enrolled in the study from 60 dogs selected. Statistically the data were not normally distributed; therefore Friedman Test was applied, Wilcoxon Matches Pairs Test and Mann-Whitney U Test where appropriate, with the significance level set at  $p < 0.05$ .

Preliminary results showed differences between adults and puppies, but these were not significant. In the owners' reports, 69% of the owners considered their dog's behaviour improved, 31% unchanged and none worse or resolved at  $V_1$ , while

at V<sub>2</sub> 38% stated that their dog's behaviour improved and 31% resolved, 23% unchanged and 8% worse. At the end of the trial, 69% stated that they were either 'very satisfied' (23%) or 'mainly satisfied' (46%) with the pheromone treatment, only 31% were 'mainly dissatisfied' and none was 'very dissatisfied'. The overall assessment of general activity (GA) differed significantly throughout all the experimental steps; the behaviours related to hiding, panting and trembling significantly decreased, while the reactions to foreign people and/or unknown noises decreased but not significantly. There was no significant difference in the socio-environmental (SE) category, while the separation reactions (SR) of the dogs during the owners' absence presented a significant difference, especially for urination and defecation. About the overall assessment of the changes in the sleep-awake cycles (SA), the difference was significant, and housetraining (HT) significantly improved too.

### ***Discussion and Conclusions***

Pheromone is a substance produced by one animal that conveys information to other individuals by olfactory means (Pageat and Gautier 2003a). Dogs perceive pheromones with their vomero-nasal organ (VNO), a paired structure situated above the hard palate that opens to the incisive canal. The stimulation of the specific receptors leads to depolarisation of the VNO with the accessory olfactory bulb. Subsequently efferent connections stimulate different structures within the limbic system, thus altering the emotional state of the dog.

The appeasing pheromone is secreted by bitches 3 to 5 days after the puppies are born; it is produced by the sebaceous glands in the inter-mammary cleft and it esterifies under the action of skin saprophytic bacteria increasing its volatility. As soon as it appears, appeasing pheromones help to create the attachment puppies have for their mothers and subsequently stabilising the emotional state of the puppies. DAP<sup>®</sup> (Dog Appeasing Pheromones) mimics the properties of natural appeasing pheromones from the lactating bitch; these substances convey a message of well-being, calm and a feeling of security. DAP<sup>®</sup> is a natural way to manage and control behavioural stress and fear/anxiety related signs in dogs. DAP<sup>®</sup> helps establish the puppy in the new family, stop or prevent fear and stress related signs in puppies and adult dogs, and comforts the dog in stressful environments. Research has actually shown that the reassuring properties of the appeasing pheromone persist even into adult age: therefore they appear to modulate both the emotional state and social interaction of the dog throughout its life. DAP<sup>®</sup> is believed to have a reassuring effect in both puppies and adult dogs in a wide variety of stressful situations (Heath and Bowen 2003; Mills et al. 2003; Pageat and Gautier 2003b; Sheppard and Mills 2003).

The preliminary results of the present trial showed that the use of DAP<sup>®</sup> at the moment of the introduction in the new house could improve the dog's adaptability throughout the adoption step. The appeasing message transmitted by pheromones

might help in preventing and/or stopping the stress-related signs shown by the dog (GA, SR, SA, HT), but the data indicated that some behavioural counselling might improve the introduction of sheltered dogs in the new family. The inclusion of a control group without DAP® or with placebo was considered improper considering the practical limitations of the study. The reliability of owner report was estimated excellent, since temperament tests conducted on dogs in rescue shelters are frequently validated using measures derived from new owners' reports of their dog's behaviour (Van der Borg et al. 1991). The adaptation process can be logically and scientifically related to the concept of stress and welfare, reducing the re-home rate.

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## Keywords

*adaptation, adoption, dog, pheromones, shelter*

# Plasma Dopamine Neurophysiological Correlates in Anxious Dogs

**M. C. Osella\***, **R. Odore**, **P. Badino**, **B. Cuniberti**,  
**L. Bergamasco**<sup>2</sup>

## **Introduction**

In the literature there is abundant evidence for abnormalities of norepinephrine (NE) and serotonin (SE) neurotransmitter systems in canine anxiety disorders (Oliver and Miczek, 1998). The alteration is likely due to a failure in the reciprocal modulation of other neurobiological systems that together mediate the symptoms of affective illness, like the dopaminergic system (DA). In reality some behavioural overlaps exist in the effects of NE, SE and DA, and it is thought that emotional disorders may reflect interactions among these neurotransmitters, which may be detected in the blood (Goldstein et al. 2003). The goal of the present research was to identify potential peripheral markers of canine anxiety disorders in order to better understand how the brain mediates behaviours and to target pharmacological treatment in anxiety.

## **Materials and Methods**

The research was articulated in different steps. Initially eight healthy service dogs enrolled in the Police Department, German Shepherd, males, three to seven years old, were tested before and after their task performance, that is before (BA) and after attack (AA) for security dogs (SD) and before (BR) and after (AR) rescue for

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*Dipartimento di Patologia Animale, Sezione di Farmacologia e Tossicologia, Facoltà di Medicina Veterinaria, Università degli Studi di Torino, Via Leonardo da Vinci 44, 10095 Grugliasco, Italy*

<sup>2</sup>*Dipartimento di Morfofisiologia Veterinaria, Sezione di Fisiologia ed Etologia, Facoltà di Medicina Veterinaria, Università degli Studi di Torino, Via Leonardo da Vinci, 10095 Grugliasco, Italy*

\*Corresponding author: osellamc@aliceposta.it

narcotic substance rescue dogs (ND). The second study group was composed of six adult male dogs (two to ten years old) with a diagnosis of chronic generalized anxiety compared with a control group of six healthy dogs, with no history either of both neurological and behavioural disorders; the dogs were tested at the time of consultation visit. Finally another ten dogs, males and spayed females ranging in age from two to five years old, with a diagnosis of anxiety related disorders, were enrolled; plasma level dosages were measured in the first consultation  $T_0$ , after four ( $T_1$ ) and eight ( $T_2$ ) weeks of drug therapy with clomipramine HCl (Clomicalm®, Novartis Animal Health, Basel, Switzerland) 2 mg/kg PO q12h besides behavioural therapy. All the dogs were clinically and behaviourally assessed, blood samples were collected to measure catecholamine (E, NE, DA) and SE plasma levels. Blood catecholamine levels (ng/ml) were measured using a RIA kit, whereas serotonin plasma concentrations (ng/ml) were determined by an ELISA kit. Data were statistically processed using a paired Student's *t*-test and Tukey Test (Graph Pad Instat).

## **Results**

In SD a statistically significant ( $P < 0.01$ ) increase in dopamine plasma levels between BA and AA was observed, and between BA-BR and AA-AR ( $P < 0.01$ ). There was no significant difference in AA vs. BR and BR vs. AR. No statistically significant differences were observed in E, NE, SE plasma levels of BA, AA, BR and AR. In dogs with chronic generalized anxiety a statistically significant ( $P < 0.01$ ) reduction of DA plasma levels was found between subjects affected by anxiety related disorders and the control group.

Both at  $T_0$  and  $T_1$ , dopamine concentrations didn't significantly differ between Clomipramine HCl treated and untreated anxious dogs. After four weeks of Clomipramine treatment ( $T_1$ ) a significant ( $P = 0.04$ ) increase in DA blood levels and a significant ( $P = 0.04$ ) decrease in SE levels were observed, as well as a significant decrease in E serum levels at  $T_2$  with respect to  $T_1$ .

## **Discussion and Conclusions**

The ability to correlate neurophysiology to behaviour is one of the most exciting areas of neuroscience; furthermore drugs that influence behaviour and improve the functional status of animals with neurological or behavioural disorders may act by enhancing or blunting the effectiveness of specific combinations of synaptic transmitter actions (Baldessarini 2001; Mills and Ledger 2001). Results pointed out a modification of the peripheral levels of monoamines throughout the project, especially for DA. Many links between transmitters and behaviours have been postulated, but it has actually been difficult to validate the essential involvement of specific transmitter-defined neurons in the mediation of specific behaviours in pets, mostly because of some bioethical and technical constraints. Consequently the

measurement of plasma levels of catecholamines, serotonin and their metabolites, especially in combination, might provide important information relevant to the diagnosis, pathophysiology and treatment effects for several conditions in companion animals in the future (Reisner et al. 1996).

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## **Keywords**

*anxiety, dog, dopamine, measurement, neurophysiology*

# Evaluation of the Owner's Influence on Dogs' Behavioural and Physiological Reactions during the Clinical Examination

**C. Palestriini\*, M. Baldoni, J. Riva, M. Verga**

## **Introduction**

Many dogs show both behavioural and physiological stress reactions to being handled by people unfamiliar to them (Vincent and Michell 1995). The clinical examination context may induce acute stress. Moreover, the owner's presence and behaviour may affect the dog (Askew 1996; Overall 1997). The evaluation of the dog's behaviour and physiology (heart rate and serum cortisol) may allow one to objectively understand the animal's reactions. In fact, these parameters are involved in adaptive response to stressors (Fox 1978; Stohr 1988; Engeland et al. 1990) and the possibility of linking physiology and observable behaviour is of great importance in gaining a better understanding of the dog's reactions to environmental changes and potential stressors (Stohr 1988; Engeland et al. 1990; Kostarczyk 1992; Beerda et al. 1998; Palestriini et al. 2001). Measuring heart rate has long been used as a psychophysiological measure of animals' affective and cognitive responses. Several studies have investigated heart rate responses of dogs (*Canis familiaris*) to different stimuli and environmental conditions (Fox 1978; Murphree et al. 1967; Beerda et al. 1997). The purpose of this study is to assess physiological (heart rate and serum cortisol level) and behavioural measures of the dog in relation to the owner's behaviour during collection of two blood samples and a clinical examination.

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*Istituto di Zootecnica, Facoltà di Medicina Veterinaria, Università di Milano, Via Celoria 10, 20133 Milano, Italy*  
Corresponding author: clara.palestrini@unimi.it



## **Materials and Methods**

Eighteen adult dogs (eleven females and seven males) ranging from one to ten years of age were used in the study. Twelve dogs were purebred and six were mixed-breed.

The experimental procedure was the following: Each dog and its owner were placed into room adjacent to the clinical examination room for 15 minutes. A video camera was positioned to record the dog's and owner's behaviour. A heart rate recording device (Polar® Vantage NV) was affixed to the animal and the heart rate was recorded at 5-second intervals to obtain a baseline value for each subject. The dog was free to explore the room for 15 minutes. During this time, the owner completed a questionnaire about the dog's physical and social living environment and the dog's characteristics and history. At the end of the 15 minutes, the dog was taken by the owner to the clinical examination room, positioned on a table, and a blood sample was taken in order to obtain the basal level of cortisol. Then the subject was again placed in the room adjacent to the clinical examination room and was free to explore that room for another 15 minutes. At the end of the 15 minutes, the dog and its owner returned to the examination room, the dog was positioned on the table, and a standardised, 10-minute clinical examination was carried out. Finally, a second blood sample was taken. The same procedure was repeated 15 days later but without the presence of the owner. Behaviour, heart rate, and serum cortisol for each subject were collected and analysed.

## **Results**

The owner's presence significantly affected the dogs' heart rates. In fact, the dogs' heart rates during the clinical examination were significantly lower ( $P < 0.01$ ) when the owner was present when compared to the second trial, when the owner was absent. No significant differences in cortisol levels were found between the first and the second experimental procedure; although during the first experimental procedure, dogs tended to show lower values ( $P = 0.06$ ) compared to the second one, when the owner was absent. The owners' presence influenced dogs' behavioural reactions, too. Dogs showed a higher percentage of aggressive behaviour (66%) in the presence of the owner during the clinical examination than during the same procedure repeated after 15 days without the presence of the owner (1%).

## **Discussion and Conclusion**

The aim of this study was to integrate physiological and behavioural measures of dogs during the collection of two blood samples and a clinical examination in relation to the owners' presence or absence. Both behaviour and heart rate are considered useful indicators to evaluate stress reactions in dogs (Kostarczyk 1992) due to the interaction between the central nervous system and neuroendocrine system (Henry and Ely 1976; Beerda et al. 1998). Our results indicate that the presence of the owner can affect both behaviour and heart rate in dogs in this particular kind of

stressful situation. The owners' absence seems to produce an acute stress reaction in dogs accompanied by an increase in heart rate and cortisol level. This is likely to be related to the reassuring effect induced by the owners' presence in potentially stressful situations.

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## Keywords

*behaviour, dog, examination, owner, restraint*

# **Aggression: An Analysis of the Frequency of Forms Seen in an Australian Behaviour Practice and Their Interrelationships with Other Relevant Factors**

***G. Perry, K. Seksel\*, L. Beer***

## ***Introduction***

Aggression in dogs has been defined as an appropriate or inappropriate threat or challenge that is ultimately resolved by combat or deference (Overall 1997). That aggression is part of a dog's normal social repertoire does not lessen its impact on the families living with dogs which exhibit this behaviour.

Aggression has been reported more often in entire male dogs although Testosterone acts as a behaviour modulator that makes dogs react more intensely (Overall 1997). A dog's emotional state can interfere with the ability to respond "consciously" or "rationally" to stimuli. When exposed to a novel or startling stimulus, the dog that is highly aroused (whether excited or fearful) may respond impulsively, reflexively and defensively. (Landsberg et al. 2003).

## ***Materials and Methods***

Ninety-nine cases of dogs that presented with aggression as the main presenting complaint to a referral practice in Sydney, Australia formed the basis of this retrospective study. Information on all cases was entered in a spreadsheet under headings which include breed, sex, neuter status, main and secondary diagnoses, as well as additional behaviour problems. This raw data has been examined.

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*Sydney Animal Behaviour Service, 55 Ethel St, Seaforth NSW Australia*

\*Corresponding author: sabs@tpg.com.au

Only cases of aggression seen at this practice classified as the following were examined for this study:

- aggression to family members
- aggression to unfamiliar people
- aggression towards other dogs in the household
- aggression towards unfamiliar dogs

The relative frequency of each type of aggression was examined along with links to other characteristics such as breed, and sex of the dog. The relationships between types of aggression are also considered, as many patients presented with more than one form of aggression. Additional behaviour problems such as attention seeking behaviour, generalised anxiety and separation anxiety were also noted.

## **Results and Discussion**

Most cases presented due to aggression were of breeds considered medium to large with German Shepherd Dogs (7), Border Collies (6), and Jack Russell Terriers (6) being the most represented breeds. Pure-bred dogs numbered 76 (77%) which was higher than expected based on the Australian pure-bred dog ownership data presented in survey results of McHarg et al. (1995).

There was no significant difference between the number of male or female dogs presented with aggression with the majority of both sexes being neutered. Female dogs were more likely to be diagnosed with fear aggression while male dogs were more likely to be diagnosed with “dominance / impulse control / status related” aggression. There was no significant difference between males and females diagnosed with interdog aggression, or aggression exhibited towards unfamiliar dogs. However, female dogs were more likely to exhibit aggression towards familiar dogs.

Most cases presented with more than one form of aggression. Fear and generalised anxiety were contributing factors in most forms of aggression. Many of the dogs that presented with aggressive behaviour, also were noted to have other behavioural problems, including separation anxiety and attention seeking behaviour.

Interestingly, despite aggression being considered by the owners to be a serious or very serious problem, with community pressures, and an increasingly litigious society, most owners, when asked in the questionnaire what they would do if the problem remained unchanged, elected to keep the dog despite the possible consequences.

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Overall K L 1997 *Clinical Behavioural Medicine for Small Animals* Mosby: St Louis

**Keywords**

*aggression, dog*

# Behavioral Description of Cannibalism in Fattening Pig Production

**D. Saffray<sup>1\*</sup>, I. Madec<sup>1</sup>, C. Lafont<sup>1</sup>, J-F. Gabarrou<sup>2</sup>, P. Pageat<sup>1</sup>**

## **Introduction**

Cannibalism in fattening pig (*Sus scrofa*) production refers to a special behavioural problem. It is characterised by repeated bites between pen-mates, leading to wounds of variable severity (Gonyou 2001). Serious wounds can lead to the death of the animal. Stress and infections following these bites result in decreased growth rates, emergency slaughter and carcass rejection at the abattoir (Fritschen and Hogg 1983). Economic losses may therefore be substantial (Arey 1991). Cannibalism is a health, welfare and economic problem.

Many solutions have been suggested but treatments have shown variable efficacy. A major reason for this situation is that the true causes of cannibalism are still unknown (Schröder-Petersen and Simonsen 2001). To find out these causes, an accurate behavioural description is essential to establish if different types of individuals with particular behavioural patterns exist.

## **Materials and Methods**

Twelve farms were selected from a list of 137 pig farms with historical records of cannibalism. Inclusion criteria were type of production, performance, genetic, type of cannibalism, type of buildings, feeding parameters, breeding methods and health status. Consequently, the selected farms were similar, allowing the constitution of a single database, with enough data for statistical analysis.

In each pig farm, 2 to 4 pens were videotaped. For each pen, one hour of video

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<sup>1</sup> Phérosynthèse, Le Rieu Neuf, 84490 Saint Saturnin Les Apt, France

<sup>2</sup> E.S.A.P., 75 voie du TOEC, 31076 Toulouse Cedex 3, France

\*Corresponding author: d.saffray@wanadoo.fr

recording was obtained with 2 sequences of 30 minutes (morning and afternoon). Video recordings were analysed by means of a reading table, focused on the bite act. Also recorded were wound status, bite type, motor act before the bite and motor act after the bite (for both the biter and the victim). With the resulting database, we carried out both a single variable descriptive analysis and a Multiple Correspondence Analysis.

## **Results**

### **Single variable descriptive analysis**

A substantial part (70%) of the population was involved in at least one bite.

Just before and just after a bite, a biter often explored its environment (35% of bites). Before a bite, a victim was often inactive and lied down (54% of bites). After a bite, this victim often remained inactive (29% of bites) or tried to escape (19% of bites).

Thirty percent of the population was made up of neutral individuals. They were never involved in bites during cannibalism.

### **Multiple correspondence analysis**

The Multiple Correspondence Analysis divides pigs involved in bites into four categories of individuals: 1) Biters who bit different body parts 2) Biters who always bit the same body part 3) Victims and 4) Individuals who are both biters and victims to the same extent.

Biters are generally uninjured or just affected by cutaneous erosion; whereas victims are affected by acute wounds, sometimes with a loss of tissue.

The ratio Given Bites/Received Bites (GB/RB) is different among each category. Biters have a ratio GB/RB equal to or over four. Victims have a ratio GB/RB equal to or under 0.25. Biters-Victims have a ratio GB/RB between 0.25 and four.

Some pigs are rarely involved in bites. They give and receive fewer than four bites and are involved in fewer than five bites.

## **Discussion**

According to these statistical descriptions, we have defined five categories of individuals that may appear when cannibalism occurs:

1. Neutral individuals (N) are not involved in bites
2. Rarely Implied individuals (RI) give and receive fewer than four bites and are involved in fewer than five bites.
3. Biters (B) have a ratio GB/RB equal to or over four.
4. Victims (V) have a ratio GB/RB equal to or under 0.25.
5. Biters-Victims (BV) have a ratio GB/RB between 0.25 and four.

Depending on the fattening pen in question, all or some of these categories were present, leading us to suppose that we observed either different types of disorders or different stages of the same disorder. To settle this point, we need to carry out a study on cannibalism evolution in a same pen.

### **Conclusion**

Cannibalism implies different categories of individuals, with particular behavioural patterns. Biters are generally uninjured or just affected by cutaneous erosion. They often explore their environment before and after biting. Their ratio Given bites/Received bites is equal to or over four.

Victims are affected by acute wounds. They are often inactive and have lain down before being bitten. They often remain inactive or try to escape after being bitten. Their ratio Given Bites/ Received Bites is equal to or under 0.25.

These definitions will be the basis for subsequent experiments on cannibalism.

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### **Keywords**

*bite, cannibalism, category, description, pig, wound*



# Clicker Training with Cats

**S. Schroll\***

With dogs, clicker training is a well-established method of education, training and therapy.

On the other hand, cats are often considered untrainable. However, this is more a question of the method used than the trainability of cats.

Based on personal experience, the particulars of clicker training cats are presented.

It can be difficult to motivate cats. Things that are motivating and rewarding for cats (hunting, sitting in the sun, observing from a top spot, etc.) are not always easy to control. The most powerful rewards to use when training are food and play. After a while, the learned tricks and behaviors themselves become rewarding to the cat.

Classical conditioning of the clicker sound is not really necessary in cats. There is a great risk of rewarding static behavior such as sitting during the conditioning. This may cause this behavior (sitting) to be the basic behavior that the cat will show when confused or frustrated in future training sessions.

In order to keep the cat's motivation high, alter the feeding schedule and find the best treats. It is recommended to follow a restrictive feeding strategy. Treats can be normal dry food for some cats, others will require really exquisite treats such as tuna, shrimp, salmon, raw ham . . . or even baby food.

There are important differences in clicker training between dogs and cats. When compared to clicker training with dogs, clicker training with cats might be disappointing, because a normal session with a cat often ends after only 3 to 5 treats. For the cat, the training has to be full of variation . . . and relaxed patience.

There are some basic guidelines for clicker training cats. Verbal cues should come as the very last step. The cat should not be touched during training. When working with a target, some—especially young—cats tend to touch the target with a

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*Hohensteinstr. 22, A-3500 Krems, Austria*

\*Corresponding author: [sabine.schroll@aon.at](mailto:sabine.schroll@aon.at)

paw instead of the nose. If this occurs, one could bring in two different targets—one for the paw and one for the nose.

To begin, try the following simple exercises. Target training, sitting or sitting on a special place (mat, crate, stool) are simple exercises for the beginner. Teaching exercises such as sit involve the risk that the cat is frozen in a behavior, thus losing its creativity and motivation to try something new. The training session ends with a cat sitting and waiting.

There are certain guidelines which will help to prevent behavioral problems when clicker training cats. Clicker training sessions are a special and high quality time for owners and cats. In addition to education and therapy, clicker training also presents a very good opportunity to inspire the cats mentally and keep indoor-only cats occupied.

Clicker training can be used in behavioral therapy. Owners normally react with some kind of punishment when their pets exhibit unwanted behavior. In the best case, this creates a ritual with the owner, by which the cat learns how to initiate a reaction with an unwanted behavior. In the worst case, this can be a stressful situation for some cats. With clicker training the attention is always on the desired behavior and the cat will learn a basic repertoire of appropriate and pleasant behavior to attract attention of humans.

**Keywords**

*cat, clicker, operant conditioning, training*

# Observations on Communication Signals Between Cats

**S. Schroll\***

## **Introduction**

Communication between cats is complex and sometimes very subtle. As humans, we have a limited ability to perceive and identify the quick, fine movements and we are physically disadvantaged when it comes to perceiving the importance of chemical communication in cat behaviour. To understand some of the messages between cats, we can rely only on acoustic and gross optical messages, such as posture, mimics and movements. It is possible to teach people to recognize the basics of cat communication using a series of pictures that show these basic elements.

## **Methods**

Different cat interactions and encounters were observed, photographed and video-taped in free, non-experimental, indoor and outdoor situations. The cats observed were familiar with each other and there were no observations of encounters between strange cats. Although it is sometimes subtle, the message that is sent by a cat can be understood by observation of the reaction of the receiving cat.

## **Results**

As cats are slightly myopic, the communication signals at a distance beyond several meters are merely postures, movements, or speed of the movements; i.e.,

- speed of approach
- sitting during the approach

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*Hohensteinstr. 22, A-3500 Krems, Austria*

\*Corresponding author: [sabine.schroll@aon.at](mailto:sabine.schroll@aon.at)

looking directly at the other cat  
looking alternately to/away or completely away  
sitting and grooming  
tail up  
tail down.

Facial expressions such as shape and openness of the eyes and ear posture have more importance for close contact. Some complex signals, such as body tension, can be felt rather than seen. It appears that cats may also include the environment in their messages, such as the place where they sit.

## ***Discussion***

It is not easy to understand, explain and teach the complex and subtle language between cats.

With the identification of typical signals and contexts in a photo series and in videos, we can give advice and teach the basics of cat language. It is very important that cat communication is not a static, but a very dynamic—even though sometimes very slow—process. Relying on a single posture is probably misleading; the complete context and movement should be taken into consideration, in the same way that one word rarely communicates the meaning of an entire sentence.

For didactic reasons we could classify encounters between cats in the following way:

1. **Non-confrontational approach:** The cats engage in a choreography of moving and stopping, sitting, licking or scratching themselves, looking away, interspersed with short looks directed at the other cat. The movements are complementary, i.e. one cat looks away and the other cat moves on, when the first cat looks directly, the moving cat stops and looks away. The moving cat shows obvious respect for the virtual personal space of the other cat, by circling around invisible (and individually changing) borders. The movements are slow and non-threatening. Head and tail are in neutral positions, the expression is attentive.
2. **Confrontational or threatening approach:** The threatening cat stares directly at the victim cat during the approach and the movements are determined. The speed of the movement can be variable from slow motion to very fast. The head is lower than the back and slightly stretched forward; the tail is low.
3. **Friendly approach:** During a friendly approach, the cats are more relaxed in their movements. There is no direct stare, but instead a deliberate looking away by turning the head. The tail goes up when the cat passes the other cat, to present the anal region. This tail up

gesture can have a short duration, sometimes a small movement and after a few steps the tail is lowered to a neutral position again. The greeting sequence is a nose to nose contact, sometimes followed by licking the head or demanding a lick respectively. After the nose contact, friendly cats present the anal region for a short olfactory examination.

## **Conclusion**

By concentrating on a few elements of the body language of cats, it is possible to explain and teach the very basics in cat communication. Complete understanding of cat communication is still a challenge for humans and will probably remain so for the foreseeable future.

## **Keywords**

*aggression, behaviour, cat, communication, measurement, social*

# Flexible Reward: Help or Hindrance When Training Horses (*Equus caballus*)?

**B. J. Whitham\*, D. S. Mills**

## ***Introduction***

A clicker consists of a metal strip contained in a plastic box that when depressed makes a “click” sound. Recent research has found variable results on the efficacy of clicker training with horses. (Ferguson and Rosales-Ruiz 2001; Zulch et al. 2001; McCall and Burgin 2002; Williams et al. 2004) This sound can be used as a secondary reinforcer, by being reliably associated with something rewarding. Using a clicker helps to improve temporal contiguity and contingency between action and reward by allowing the marking of remote events. This process allows behaviour to be shaped towards a predetermined goal. (Pryor 1995) Behavioural shaping is the popular term for successive approximation (Chance 1994), whereby the steps that lead to a final behaviour are reinforced in succession. By progressively raising the criteria required while still reinforcing, the quality of performance can be increased.

A study conducted by Midgley et al. (1989) compared the performance of a complex behaviour (token deposition) by rats using two methods of successive approximation. The authors found that using a predetermined schedule (in which the animals’ behaviour was required to correspond with the schedule in order to achieve reinforcement) was as effective at training as ‘hand shaping’ (where no predetermined schedule was set). In reality, when training, few people consistently use a predetermined schedule and so this result is important, but its general application to other species remains unknown.

Despite the growing popularity of clicker training in the horse world there remains a gap in our knowledge comparing the efficacy of different schedules that

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*Animal Behaviour, Cognition and Welfare Group, University of Lincoln,  
Riseholme Park, Lincoln, LN2 2LG, UK*

\*Corresponding author: [bwitham@lincoln.ac.uk](mailto:bwitham@lincoln.ac.uk)

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might be used in shaping behaviour. Therefore, the aim of this study was to quantify and compare the effect of two methods of successive approximation on the rate of learning target touching (where the individual is trained to move towards a specific target and touch it with their muzzle, for a steadily increasing duration), one of the initial stages popularly used when clicker training a horse (Kurland 1998).

### **Materials and Methods**

Twelve horses were trained to perform a reversal discrimination task using two circular wooden targets. Criteria were set to define different levels of the shaping process:

<b>Level</b>	<b>Criterion</b>
0	Touching the target with any part of the horse's face
1	As above for the duration of a count of "one"
2	As above for the duration of a count to two
3	As above for the duration of a count to three

Under the "rigid" method, only responses that reached the criterion were reinforced. Under the "flexible" method, if a sequence of responses did not reach criterion, then the horse was allowed to go back a level and was reinforced for a touch that did not meet the current criterion. Each horse was used as its own control in a balanced cross over design. The following parameters were compared between the two training regimes using Wilcoxon signed rank test: time taken at each level, number of reinforced touches at each level, number of touches to correct target that did not meet criterion (failures), number of touches to the incorrect target (misses).

### **Results**

There was no significant difference between the two training methods on the number of rewarded touches, the number of failures or the time taken to complete the task. However, horses touched the wrong target significantly less frequently under the flexible reinforcement schedule ( $P < 0.05$ ).

Median total no. of failures and misses performed using each method.

Method	Median total no. of misses (range)	Median total no. of failures (range)
Rigid	5.0 (0.25–13.50)	12.5 (4–26.5)
Flexible	0.0 (0–2)	12.0 (2–26)

The following results, though not statistically significant, were noted as possi-

ble indicators of learning ability that may warrant further investigation with a larger population, using the two methods.

- the number of misses accumulated in level 3 ( $P = 0.071$ )
- the time taken in seconds to complete level 3 ( $P = 0.091$ )

## **Discussion**

Under both training methods, horses required a similar number of reinforcements and took a similar length of time to reach criterion for the discrimination tasks. However, they appear to have made fewer discriminatory errors when trained under the flexible method. In more challenging tasks, other differences between the methods might also become apparent. Nevertheless, this study has shown that occasional periodic reinforcement, even below the level of performance expected, does not decrease the overall rate of learning and may help reduce the number of errors made by horses, when learning new tasks. As clicker training grows in popularity what affects its success as a technique to train horses grows increasingly pertinent to horse welfare and good working practice.

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### **Keywords**

*clicker, horse, learning, shaping*

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This volume illustrates the diversity of ongoing research in the field of applied animal behavior and includes the current findings of scientists, veterinarians and practitioners. The materials included will provide new additions to the growing knowledge base, refine or confirm current opinions, provide avenues for further research, and increase the appreciation and understanding of the different approaches used internationally within the discipline. A major trend is the addition of more empirically based contributions.

### SELECTED CONTENT:

- Using Multiple Correspondence Analysis to Define Groups of Dogs (*Canis familiaris*) at Risk for Aggressive Behaviour
- A Comparison of Cases Referred to Behaviorists in Three Different Countries
- Development of Grazing Posture Preference in Foals (0–1 Yr) and Their Dams and Its Relation to Other Asymmetrical Behaviours
- Trends in Canine and Feline Behavioral Diagnoses: 1991–2001
- Grief Following Death of a Companion Animal
- Treatment of Generalized Anxiety in a Cheetah (*Acinonyx jubatus*)
- Stress in Avalanche and Rescue Dogs (*Canis familiaris*) during Search Work



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