

Understanding Kennel Stress in Canines (*Canis lupus familiaris*)—A Review of the Literature

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Introduction

In 2008, the United States spent 43.2 billion dollars on pet products and services. This amount is expected to grow by more than six percent annually (APPA, 2008). Companion animals are very much a part of American lifestyles. People include dogs in everyday activities such as work, going for a stroll, vacationing, going on overnights with children, driving in the car, and shopping at pet-friendly stores. Research reveals human–animal bonded relationships have profound therapeutic effects on all aspects of our wellbeing (Beck & Katcher, 2003; Brown, 2004; Johnson, Meadows, Haubner, & Sevedge, 2008; Odendaal & Meintjes, 2003; Prato-Previde, Custance, Speizio, & Sabatini, 2003; Rossetti, DeFabiis, & Belpedio, 2008; Serpell, 1996). Health benefits for people emotionally attached to a dog are profound. Dogs experience similar health benefits in attached relations with familiar people (AVMA, 2009). This is due to improved nutritional and veterinary care when a dog is cared for adequately. The human–dog bond is a win–win situation. Bonding and wellness benefits promote empowerment and greater attachment to pets (Fine, 2006). It makes sense that dogs are beneficial in fulfilling a niche for people wanting companionship.

A growing number of people are adopting pet dogs from humane societies and rescue groups to fulfil a companion role. These animal welfare organizations are full of dogs in need of homes. Unfortunately, kenneled dogs (those contained in an enclosed system in such places as humane societies, rescue kennels, pet stores, research facilities, etc.) can experience stress related issues which can impact their immune response, sociability, and health (Blecha, 2000; Hewson, Hiby, & Bradshaw, 2007). Kennel stress (symptoms exhibited by a dog during a time of containment) is one of the reasons why

dogs do not fare well in contained areas for long periods of time (HSUS, 2009). Examples of kennel stress in dogs include, but are not limited to, figure-eight spinning in the kennel, vertical jumping at the kennel gate, repetitive pacing, startle responses, stress defecation, appetite loss, exaggerated auto-grooming, coat moulting or sloughing, panting, paw sweating, muscle tremoring, ears held in tension, spatulate tongue, flicking tongue, drooling, pupillary dilation, tense facial musculature, yawning, and distress whining (Abrantes, 1997; Aloff, 2005; Beerda, Schilder, VanHooff, DeVries, & Mol, 1999; Handelman, 2008; Rugaas, 1997; Scholz & Von Reinhardt, 2007).

Dogs who endure a stressful life in a kennel often have a host of other issues that surface. These issues are usually behavioral in nature (Hiby, Rooney, & Bradshaw, 2006; Stephen & Ledger, 2006; Taylor & Mills, 2007a; Wells, Graham, & Hepper, 2002). Some of the behavioral problems identified in the literature that result from kennel stress include inadequate socialization skills (Stephen & Ledger, 2006), autogrooming (Hiby et al. 2006), and vocalization (Wells et al., 2002). If animal caregivers understand the impact of kennel stress in dogs, they can intervene earlier. Early intervention could create opportunities for the dog to learn new coping skills and be more tolerant of the aberrant housing conditions a kennel offers. By decreasing kennel stress, dogs exhibit fewer behavioral problems while housed in the shelter (Scholz & Von Reinhardt, 2007). A better behaved pet can get adopted sooner (American Kennel Club, 2009). If kenneled dogs are better showcased for the community, they would have a good chance of getting adopted and being part of a family. Adoptive dogs who exhibit fewer maladaptive behaviors tend to stay in the home long term. Once a dog becomes situated in the home, owners are invested in their

new companion and can teach the dog coping skills and default behaviors to adjust to any new routines. This paper will review the scientific literature on kennel stress in dogs and address three key areas: 1) physiological issues pertaining to stress, 2) kennel structure and containment stresses, and 3) lack of socialization skills pertaining to kenneling.

Definition of Kennel Stress

Canine stress is a state in which a dog reacts to an endogenous or exogenous threat and focuses its energies on coping with a dangerous situation (Scholz & Von Reinhardt, 2007). There are many emotional states that could elicit a stress response, including arousal, fear, nervousness, and agitation/frustration. Stress is the response of an organism to a demand placed upon it to change or adapt (O’Heare, 2005). Kennel stress is elicited when a dog is contained for a period of time and exhibits signs of stress (Abrantes, 1997; Aloff, 2005; Rugaas, 1997). The stress response is divided into three general states: the recognition of a stressor, the biological defense against the stressor, and the consequences of the stress response (Moberg, 2000). Noise, immobilization, novelty, transport, or restricted housing conditions can elicit stress responses in behavioral, cardiovascular and endocrine parameters for dogs (Beerda et al., 1999).

Literature Review

Physiological Issues Pertaining to Stress

Humane societies and rescue groups across the country prepare pet dogs for adoption into family homes. Many of the animals who come into shelter systems are stray dogs. Not all animals get adopted right away. Unfortunately, when canines are housed in kennels for long periods of time, they can begin to show clear signs of stress (Hewson et al., 2007; Hiby et al., 2006; Tod, Brander, & Waran, 2005). Stress affects a variety of physiological systems in the dog’s body, including endocrine and sensory systems.

Cortisol is a hormone produced by the adrenal glands in response to stress and anxiety (Weber, 1998). This hormone can be measured

in serum, saliva and urine. Noninvasive collection of cortisol is the best method as it does not lend to added stress for the animal (Rooney, Gaines, & Bradshaw, 2007). Cortisol levels are produced in response to all sustained arousal, not only that produced by stress (Hiby et al., 2006).

Studies on cortisol have been done on dogs experiencing stress caused by thunderstorms (Dreschel & Granger, 2009), search and rescue training (Ahrens et al., 2005), noise in shelters (Coppola, Grandin, & Enns, 2006), environmental changes (Haverbeke et al., 2008), and sled dog racing (Durocher et al., 2007). Dogs experiencing stress will produce elevated cortisol levels (Russell et al., 2007; Stephen & Ledger, 2006). Glucocorticoids and cortisol play a role in dog kennel stress, especially during crated transports (Hiby et al., 2006; Rooney et al., 2007). Transportation in a crate from one humane society to another or from one rescue organization to another is highly stressful for dogs. Dogs involved in interstate transfers will succumb to many stressful symptoms, such as stress whining, barking, urinary/fecal elimination in their crates, and panting (Rooney, Gaines, & Bradshaw, 2003).

Stress cortisol levels in dogs have been studied in relation to kennel stress. Hiby et al. (2006) found that dogs who were more active in their kennels harbored higher levels of cortisol. Hewson et al. (2007) found that female dogs exhibited more signs of stress than male dogs during kenneled situations.

Quality of life is always a consideration when we are studying kennel stress. Another study researched the correlation between number of days dogs were kenneled and urinary cortisol levels (Hewson et al., 2007). In looking at six different populations of dogs, the initial days in which they were kenneled showed the highest cortisol levels. As the dogs became habituated to their time in the kennels, their cortisol levels decreased. Analysis shows gaps in the literature regarding correlation between kennel stress and canine age, cortisol levels, and breed specificity.

Some humane societies experience noise at very high decibel levels (Coppola, Enns, & Grandin, 2006; Sales, Hubrecht, Peyvandi, Milligan, & Shield, 1997). Higher noise levels contributed to increased mobility in the dogs' kennels. Arousal levels were higher when dogs were on display for adoption because of an increase in the volume of traffic of possible adoptive families walking through the kennels. The dogs were not as calm as when noise levels were lower. Other factors that caused an increase in noise levels among kenneled dogs were initial arrival times when employees would start their work day, and during dog feeding and kennel cleaning routines. External sources of noise that heightened kennel stress included outside vehicular traffic and trains crossing at railroad stations (Sales et al., 1997). Dogs were noticed to be quieter after the lights were turned off at the end of the day. A study showed that dogs spent more time resting in nonstanding positions (lying flat or sitting) when classical music was played. While heavy metal music was played, mobility in the kennel increased and barking was more frequent (Wells et al., 2002). Kenneled dogs who hear other dogs barking are stimulated by the vocalization and will maintain higher arousal levels and increased mobility in their kennels. The increased vocalization usually presents with barking and stress whining. Sales et al. (1997) found consistent data in their research and claimed that dogs are quieter at night when noise levels are lower.

Canine energy levels escalate and become more aroused when kennel employees come in to work in the mornings. This escalation may also be centered around learned patterns of associating employee arrivals with elimination and feed times. Although dogs in shelters are less mobile and quieter while hearing music being played, as previously mentioned, they also are calmer and have more down time after the music has stopped. Dogs will lie quietly in their kennels for a specific amount of time before they become escalated again. The behavior presented by a dog is individual, and dogs experience stress in different ways (Rooney et al., 2007).

Older dogs who exhibit pathological behaviors are not readily adopted (Foster & Smith, 2001). These types of dogs can be in kennels for many months, and sometimes years, especially if there is a no-kill policy. Dogs who are kenneled for long periods of time were witnessed spending greater than 50% of their time lying down in the kennel (Bergeron et al., 2002). Seventy-five percent of long-term kenneled dogs remained inactive (Bergeron et al., 2002). Dogs present poorly and exhibit more pathological behaviors, such as autogrooming, flank sucking and self mutilation, when they do not get adequate mental stimulation (McMillan, 2002). Ultimately, they do not showcase well in adoption centers. Animal welfare society staff are creative in adoption programs such as adopt-a-thons and the use of large-scale geographic marketing strategies to get these canines adopted. Dogs are brought to communities for adoption for people convenience. Possible adoptive families do not have to travel far and have opportunities to see dogs who may not be showcased in their community.

Kennel Structure and Containment Stresses

The structure of the kennel can provide comfort for a dog and decrease stress levels. A platform built into the kennel can function in different ways. Platforms provide a surface to keep the dog from lying on the cement floor throughout the day (Feldhaus, 1980). This is especially helpful for older dogs, or dogs who present with arthritis or orthopedic medical problems. Feldhaus (1980) claimed that dogs spent more than 50% of their time on their platform bed. Some innovative humane societies that offer real-life home-like dwellings for animals report that dogs use the furnished kennels more than the nonfurnished. Another function of the platform is that the dog can move away from any elimination of urine or feces and not smear through it. Instilling a double kennel separated by a guillotine gate can allow the dog to move from one kennel to another during cleaning rituals, and also provide more space if the dog is mobile in their kennel (HSUS, 2009). These functions can help decrease kennel stress.

Kennel size has an effect on the mobility of the dog. Dogs housed in smaller kennels than in standard sized kennels showed decreased exercise activity (Clark, Calpin, & Armstrong, 1991; Hughes, Campbell, & Kenney, 1989; Neamand, Sweeny, Creamer, & Conti, 1975). When people were present, the dogs would increase activity, and, when alone, the dog's activity would decrease. Female dogs can show more stress in the kennels than males (Beerda et al., 1999). Females exhibited more stress than males when space was restricted. When females were challenged, there was increased aggression, excitement, and uncertainty. There was a reported escalation in autogrooming, paw lifting, coprophagia and vocalization (Beerda et al., 1999). Although these results were reported, another study found no difference in stress levels between males and females in research conducted on urinary cortisol and kenneled dogs (Stephen & Ledger, 2006). Decreased spatial areas for housing at times when humane societies have high intake volumes of nonadopted dogs make for difficult choices in what dogs to present to the adoption floors.

Dogs housed alone were more inactive (Hubrecht, Serpell, & Poole, 1992) than those who were housed with another dog. Dogs housed with another dog showed less signs of stress and increased activity in the kennel. This approach may not work if two dogs are exhibiting dog-dog aggression, if one of the dogs has some medical impairment that by allowing another dog to be present in the kennel could be a detriment to their health, or if two dogs are intact and can breed. Dogs spent more time in runs and outdoor pens than they did in the kennels (Hetts, Clark, Calprin, Arnold, & Mateo, 1982). Greyhounds kenneled for air transport showed more signs of stress while they were in the cargo area of the plane than in normal conditions (Leadon & Mullins, 1991), but showed no effect on stress related to kennel size. Dogs who were contained in kennels and not allowed free access to movement exhibited more pathological behaviors (Hughes, Campbell, & Kenney, 1989). These pathological behaviors included licking the wire crate, barrier manipulating, biting and chewing on self, whining, and jumping at the sides of the crate.

Lack of Socialization Skills Pertaining to Kenneling

A well-socialized dog is a good fit for a family looking to adopt a pet (Thorn, Templeton, Van Winkle, & Castillo, 2006). Dogs with inappropriate social skills are a challenge when finding primary homes. Numerous signs of stress in these dogs can include autogrooming, lifting paw, vocalization, and repetitive behaviors (Beerda et al., 1999; Sonderegger & Turner, 1996). Many adoptive families want dogs without behavior problems. Dogs who are presenting with kennel stress need early socialization, exposure to novelty, and training, to offset the stress. Human interaction of play, grooming and petting can decrease stress and cortisol levels (Coppola, Enns, & Grandin, 2006).

Taylor and Mills (2007) found consistently that puppies who were housed together exhibited less disturbed behaviors, and were quieter for greater portions of the day when they had a kennel mate. Hetts et al. (1982) researched dogs with poor social skills. These dogs showed increased vocalization, and increased bizarre movements. Hubrecht et al. (1992) found that dogs grouped together in one kennel spent more time investigating the floor and experiencing their own levels of mental stimulation. Over time, the more solitary they became, the more they did not approach the front of the kennel (Taylor & Mills, 2007). One of the gaps in the literature is evidence on the correlation between the age of the dog and kennel gate approach.

Socialized dogs get more access to resources, such as more handling and engagement in human relationships, which can lead to quicker adoption rates. If dogs are well integrated into obedience classes and social play, there is a better chance for them to have opportunities to become more social with people (Sonderreger & Turner, 1996). This in turn would increase the likelihood of them getting to the adoption floor, as many young families looking for a companion dog are attracted to dog sociability.

Research reveals a correlation between the behavior of a rescue dog and the length of time they spend in the kennel (Hughes et al., 1989; Taylor & Mills, 2007a). Dogs who have been housed for long periods of time in a kennel tend to spend more time in the back of the kennel and show less social greeting behavior at the front of the kennel (Hughes et al., 1989; Taylor & Mills, 2007a).

Dogs who were paired together in the kennel exhibited less travelling distance (mobility) in the kennel. Less than 6% of the dog's time in a kennel was spent exercising (Hughes et al., 1989). When people entered the kennel area, the dog's activity would escalate and they would become more mobile. When there was less people traffic, kenneled dogs were quieter (Hughes et al., 1989).

Treatment

There is minimal data on the use of medications to treat kennel stress. Veterinarians are prescribing medications to help stabilize the dog who exhibits significant signs of stress (Davidson & Plumb, 2008). Dog appeasing pheromone (DAP) has some evidence in reducing some of the behavioral indicators of stress in dogs (Tod et al., 2005). DAP is a dog pheromone that gets sprayed from an atomizer fixed on a wall near their kennel area. The dogs presented quieter in that environment.

Environmental enrichment is very helpful in restoring a calm dog from a highly aroused state (Wells, 2004a). The use of toys helps drop escalated dogs back to baseline levels (Wells, 2004b). Toys are best used with some supervision to monitor destructive activity and possible ingestion. Exposure to novelty, such as mental stimulation toys, is a good learning experience for kenneled dogs and helps to offset stress levels, decrease mobility in their kennels, and decrease vocalizations. A training program of desensitization and counterconditioning to novel situations utilizing positive reinforcement techniques can decrease fear or stress, as well as

encouraging the human–animal bond process (Haug, 2004).

Conclusion

In a prominent and lucrative pet industry, it is important to know about our pets' needs and provide the highest quality of life for the animal. Management of stress is challenging for most people and can be challenging for our companion dogs. Dogs who are kenneled can show numerous signs of stress. There are physiological issues that will need to be addressed, management of structural containment spaces, as well as training for social skills and desensitization to novelty. The longer the dog is kenneled, the more emphasis is needed to address these issues.

Being able to manage the dogs through awareness of their body language and identification of signs of kennel stress will put us one step forward in addressing and managing the stress of long-term kenneling. Decreased stress levels in dogs can promote stronger human–animal bonding. Treatment of dogs exhibiting signs of kennel stress include training, environmental enrichment, exercise, medication, and DAP. The more stable the dog's physiological state, the better candidate they are for adoption. If we place more stable dogs in homes, owners should have a better chance of managing issues that surface with local support of veterinarians, behaviorists, humane societies and dog trainers. Better human–animal bonding and better trained pets can decrease social problems in the community related to ill-behaved dogs.

Research directions can address current gaps in the literature such as breed specificity and containment stress, the home use of DAP before and after kenneling and its effect on canine stress, exercise sessions before and after time in the kennel, and monitoring levels of stress by training the dogs and providing mental stimulation at routine times each day.

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