

## **Canine Fear, Anxiety and Aggression: Treatment options & welfare implications for domestic dogs (*Canis lupus familiaris*)**

Discusses multiple treatment options relating to canine fear, anxiety and aggression, and consequential impact on domestic dog welfare.

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### **Introduction**

Anxiety and fear are common underlying factors in many canine problem behaviours, including aggression. They are affected by genetic and environmental factors, especially in early life, and have dog and human safety implications (Landsberg et al. 2015a; Tiira & Lohi 2016). These behaviours can affect dogs' health, the human-dog bond and inter-dog social interactions, potentially leading to affected lifespan, decreased owner commitment, surrender or euthanasia (Dreschel 2010; Landsberg et al. 2015a). Treatment with desensitisation and counter-conditioning is not always viable due to variability in owner compliance and consistency (Sheppard & Mills 2003). Therefore, options such as psychoactive drugs, dietary supplementation and pheromotherapy can be used simultaneously with training to achieve reduction in fearful, anxious and aggressive behaviours, resulting in improved canine welfare.

### **Discussion**

Fluoxetine and clomipramine are psychoactive drugs licensed for treating canine anxiety. Pairing psychoactive drugs with corrective behavioural programs could lead to decreased problem behaviours by reducing negative psychological state. However, limitations to psychoactive medications can include time taken to reach therapeutic concentrations (1-2 weeks for fluoxetine), contraindications, potential for side-effects and owner-bias or reluctance derived from prejudices or past experience with psychoactive drugs (Sheppard & Mills 2003; Landsberg et al. 2015a).

Fluoxetine is a selective serotonin reuptake inhibitor registered for treating separation anxiety in dogs. Limitations include unwanted side-effects such as increased arousal or aggression (Crowell-Davis & Murray 2008; Siracusa 2016). However, effects on serum serotonin, dehydroepiandrosterone and cortisol concentrations in aggressive dogs, as well as owner-reported decreases in frequency and severity of aggressive episodes have been found (Rosado et al. 2010). Treatment with fluoxetine along with concurrent behavioural modification is shown to alleviate separation anxiety in dogs by shifting cognitive bias away from a negative affective state (Karagiannis et al. 2015). Investigation using spatial cognitive bias tests involving the location of full versus empty food bowls identified pre-, peri- and post-treatment changes. Owner reports monitored clinical progress. Positive changes in cognitive bias were found, suggesting improved behaviour and welfare in dogs with separation anxiety.

Clomipramine is a tricyclic antidepressant registered to treat stereotypic behaviours and anxiety disorders in dogs. A previous study tested the efficacy and tolerability of clomipramine in dogs with separation anxiety and found a positive effect when given at a standard dose (1-2 mg/kg, PO, q.12 h). However, some dogs showed side-effects of mild, transient vomiting (King et al. 2000).

Siracusa (2016) investigated a recent case of increasingly frequent and severe inter-dog aggression between two speyed bitches in the presence of high-value resources. Aggression initiated by one bitch continued despite owners' correction attempts and resulted in increased levels of anxiety in the other bitch, as well as mild to extensive injuries to both dogs and one owner. An assessment was conducted in a controlled environment which provoked an incident followed by behavioural, physical and laboratory evaluations. The initiating bitch was diagnosed with status-related aggression while the other was diagnosed with fear-related aggression. They were both considered to have underlying anxiety contributing to incident severity. Owners were advised to avoid trigger-situations and to separate unsupervised dogs for 6-8 weeks. A treatment plan involving behavioural advice combined with drugs was implemented. Positive punishment (leash corrections and yelling "no") ceased and classical conditioning was employed to build an association between high-value resources and each of their respective 'safe-havens' which were determined by preference tests (a crate for the initiating bitch and a bedroom for the fearful bitch). Owners were taught to use behavioural modification techniques such as positive reinforcement and negative punishment (retracting attention) on each dog separately, as well as small-sized treats. Clomipramine (1.38 mg/kg, PO q.12 h for 7 days; 2.76 mg/kg, PO, q.12 h thereafter) was prescribed over fluoxetine for the initiating bitch to decrease anxiety, produce a mild sedation and avoid increased arousal. The other bitch was prescribed fluoxetine (0.5 mg/kg, PO, q.24 h for 7 days; 1 mg/kg, PO, q.24 h thereafter). Dosing was staggered to reduce incidence of side-effects, and off-label use was discussed with owners. Considerable improvement was noted after six months. However, owner compliance was extremely important for consistent training and medicating, posing potential limitations when recommending similar treatment to other cases.

Natural products are currently retailed for behavioural therapy. However, evidence of their efficacy is limited. Landsberg et al. (2015a) conducted an initial study to explore anxiolytic effects of natural fish protein: fish hydrolysate. Subjective behavioural assessment, automated quantification of movement/inactivity, as well as blood cortisol concentrations were examined during thunderstorm models consisting of thunderstorm audio recordings played before and after oral supplementation. Results showed that fish hydrolysate can be used in canine noise-induced anxiety with moderate efficacy in reducing circulating cortisol concentrations. Limitations affecting external validity include the novelty and small-scale size of the study. Therefore, further research would be necessary to provide supplementary results with increased external validity surrounding anxiolytic effects of dietary fish hydrolysate supplementation. This may lead to alternative treatment for dogs unable to take psychoactive drugs due to contraindications or owner reluctance, or as supplementation to those already being treated with drugs.

Dog-appeasing pheromone (DAP) is a synthetically-derived analogue of a pheromone secreted by the lactating bitch thought to induce a sense of wellbeing and calm. Previous studies suggest decreases in response severity

after trialling the effect of DAP diffusers in dogs with firework-related fear (Sheppard & Mills 2003). Landsberg et al. (2015b) investigated the efficacy of DAP collars in reducing noise-induced anxiety and fear during a thunderstorm simulation identical to the one in the previous study. Results showed that they were effective, likely by reducing reactivity. However, small sample numbers as well as a limited range of ages (7-12 years) meant only a relatively small population was studied and young dogs were not considered. This could potentially limit external validity given the importance of early life in the development of canine anxieties (Tiira & Lohi 2016). Thus, further research is necessary. These results are hopeful and the use of DAP in conjunction with other discussed options may eliminate or reduce welfare implications by reducing fear, anxiety and subsequent aggression in dogs.

## Conclusion

Ultimately, canine problem behaviours arising from fear, anxiety and/or aggression in domestic dogs can result in compromised canine welfare and potentially human safety. Treatment options such as psychoactive drugs, dietary supplementation and pheromone therapy used simultaneously with behaviour modification training could achieve a reduction in fearful, anxious and aggressive behaviours in domestic dogs, subsequently improving canine welfare.

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