Improving the Welfare of Geriatric Dogs through early Diagnosis and Treatment of Canine Cognitive Dysfunction

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Introduction

Canine Cognitive Dysfunction (CCD) is a neurodegenerative disease affecting old dogs; it causes alterations in perception, memory, learning and awareness (Landsberg *et al.,* 2003). The behavioural changes are often undesirable to owners and can potentially cause anxiety in the dogs. The neurodegenerative changes in dogs are very similar to those observed in humans suffering with Alzheimer's disease, which provides insight to the emotional effects that CCD might have on dogs (Seibert & Landsberg 2008). Although there is no current cure for CCD, there are nutritional and pharmaceutical supplements available to mediate symptoms and impede development (Araujo *et al.,* 2008). This essay investigates recent studies on possible risk factors for the development of CCD and management strategies to reduce the undesirable effects of aging to improve the welfare of geriatric dogs.

Discussion

Diagnosing CCD is difficult because it is largely based on the owner's perceptions of his dog's altered behaviour. After ruling out medical or pathological causes, CCD can be considered if changes in awareness, activity, anxiety (increased irritability, pacing, excessive vocalising for no apparent reason), learning and memory (house soiling, loss of recognition), sleep-wake cycles and social behaviour are observed (Landsberg *et al.*, 2003). Predicting the likelihood of CCD development in aging dogs would facilitate treatment and early diagnosis of the disease. Azkona *et al*. (2009) performed a cross-sectional study to link behavioural changes associated with CCD to potential risk factors, including sex, reproductive status, age and bodyweight. In this study 325 dogs older than 9 years were chosen on the bases of age and absence of current medical problems potentially causing symptoms analogous with CCD. Owners were questioned about their dog's behavioural signs within the categories of sleep/wake cycles, social interaction, learning and housetraining, and disorientation. Cognitive impairment was assessed depending on the number of signs exhibited by the dog.

The results reveal a significant proportion (22.5%) of geriatric dogs showed cognitive impairment, with severity of impairment increasing with age. Behaviours within the categories of learning and housetraining and social interactions were the most impaired. Consequently disruptions in these categories can compromise the owner-dog bond (when memory loss stops the pet from recognising its owner), and lead to punishment and increased anxiety in the dog (Stafford, 2006). An unprecedented correlation between sex, reproductive status and prevalence of CCD was also made. Females were more likely to develop signs than males, and de-sexed dogs were significantly more likely to show cognitive impairment. This indicates a possibility that hormonal factors can contribute to the neurodegenerative process. This information can be used to indicate the use of hormone supplements as a neuroprotective (Hart, 2001).

The results from Azkona *et al.* (2009) can be used to initiate treatment options early in the disease process, delaying development of clinical signs and improving welfare of geriatric dogs. Araujo *et al*. (2008) tested the combination of phosphatidylserine, *Ginko biloba*, vitamin E, and pyridoxine as possible neuroprotective agents in dogs. To investigate the effectiveness of this supplement the delayed-non-matching-to-position (DNMP) test of short-term memory was used in 9 lab-bred beagles 7-12.7 years old. The dogs were split into two groups; Group 1 received the supplement and Group 2 was the control. After 66 days both groups were tested under the same conditions. In Phase 2, Group 2 got the supplement and Group 1 was the control. In both phases the dogs receiving the supplement performed better during their short-term memory tests. Furthermore, a high level of performance remained in

Group 1 after the supplement had been removed from their diet, suggesting long-term effects from the nutraceutical (Araujo *et al.*, 2008). Different behavioural problems require different treatments, but to combat the neurodegenerative process antioxidants and neuroprotectives have been shown to improve memory, learning and social behaviour (Osella *et al*., 2008). By delaying the onset of clinical signs we can reduce adverse welfare implications associated with CCD.

While Azkona *et al.* (2009) based their study on subjective information through telephone interviews (a limiting factor), Araujo *et al.* (2008) were able to quantitatively and objectively measure cognitive function through the DNMP test. This test can detect deficiencies as early as 6 years of age while many owners rarely notice CCD signs until their pet is at least 11 (Araujo *et al.*, 2008). The restricted sample size and short duration of both studies also present limiting factors. Ideally, the studies would have taken place over one-two years. CCD is a progressive disease so the longer the duration of the study, the more comprehensive is the data collected and the better long-term effects of neuroprotective agents can be documented.

Alterations in mental wellbeing (caused by neurodegenerative changes) may ultimately lead to reduced quality of life. Undesired behaviours, such as inappropriate urination, aggression and vocalisation, are common signs of CCD and are also causes of relinquishment or punishment in household pets (Seibert & Landsberg, 2008). For example, uncontrollable house-soiling caused by a dog's reduced or lost ability to signal may result in punishments from the owner. This can disrupt the owner-dog bond. Since we cannot directly measure emotion in animals, we must rely on their behavioural responses to certain stimuli (Mendl *et al.*, in press). Seibert & Landsberg (2008) discuss the importance of diagnosing and managing behavioural problems in the veterinary clinic with the goal of improving welfare with appropriate treatment therapy. Increased vocalisation and irritability observed in CCD patients can be considered anxiety-related based on its association with similar signs seen in human Alzheimer's disease (Seibert & Landsberg, 2008).

Conclusion

Neurodegenerative changes in dogs alter their behavioural patterns, disrupting their normal way of life and negatively affecting their welfare. Knowledge of risk factors may improve welfare through earlier diagnosis and treatment. The quality of life of geriatric dogs may be improved through the use of nutraceuticals that reduce adverse behavioural changes associated with CCD and therefore prevent disruptions in the owner-dog bond. The welfare of CCD patients could further be improved through studies assessing the stress levels associated with the behaviour changes and thus allowing veterinarians to target these areas with appropriate treatment.

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