Hill's
Transforming Lives

Complete and Balanced Food Tailored for Senior Dogs Helps Manage Age-Related Cognitive Decline and Improves Mobility to Enhance the Lives of Senior Dogs

Clinical Evidence Report

INTRODUCTION

Both canine cognitive dysfunction syndrome (CDS) and degenerative joint disease (DJD) are significant problems in older dogs.[1,2] A unified theory of ageing suggests that senescence is a complex interplay between programmed deterioration and acquired damage, with oxidative stress playing a significant role.[3-5] Reactive oxygen species cause oxidative stress and act over a lifetime to produce cumulative DNA, protein and lipid damage.[3] Through this, oxidative damage is believed to play an important role in the pathogenesis of CDS, contributing to neuronal dysfunction and subsequent neuronal death.[6] Clinically, dogs with CDS may exhibit varying degrees of cognitive impairment, including increased or new onset of anxiety, disturbances in their sleep–wake cycle, decreased interactions with their families, loss of house training and episodes of disorientation. Another common condition of ageing dogs is DJD, which is the end-stage of an interplay between genetic and environmental factors contributing to the activation of molecular and cellular pathways that advance joint injury, resulting in joint pain and decreased mobility.[7]

Pharmacotherapeutics have traditionally been prescribed to treat both conditions.[8-10] However, an enhanced understanding of the role of nutrition in health and disease, including CDS and DJD, has led to studies documenting the benefits of nutritional intervention as part of multimodal management for these conditions. **Hill's Prescription Diet b/d**, a food fortified with antioxidants, mitochondrial cofactors (which are complementary to mitochondrial function) and Omega-3 fatty acids from fish oil, has been shown to slow manifestations of age-related cognitive decline in dogs.[11-13] This food helps protect the brain from oxidative stress and from the effects of reactive oxygen species through the action of antioxidants vitamin C and E and improves age-related behaviours in older dogs. Omega-3 fatty acids have also been shown to be effective in reducing pain and improving mobility in dogs with DJD compared to those fed a control food.[14-17] Omega-3 fatty acids provide clinical benefit to dogs suffering from DJD by helping to manage inflammation and by reducing the expression and activity of cartilage proteoglycan-degrading enzymes. Nutritional management of canine DJD with **Hill's Prescription Diet j/d** Canine has been proven to be effective at both reducing clinical signs and improving weight-bearing ability in these patients.[16,17]

Because CDS and DJD are two of the most common conditions impacting the lives of adult dogs as they age, Hill's Pet Nutrition developed **Hill's Prescription Diet Brain Care + j/d Canine**, which combines the nutrition of b/d and j/d. Brain Care + j/d is the first therapeutic food to address both common comorbid conditions that impact the quality of life of adult dogs as they age. Synopses of key studies demonstrating the efficacy of each of these parent therapeutic foods is provided here.

COGNITIVE DECLINE

Learning ability in aged beagle dogs is preserved by behavioural enrichment and dietary fortification: a two-year longitudinal study

Milgram NW, Head E, Zicker SC, et al.

Neurobiol Ageing. 2005;26:77-90

KEY POINTS:

- In this two-year longitudinal investigation of learning ability, the effects of a dry complete and balanced dog food fortified with antioxidants and mitochondrial cofactors (Hill's Prescription Diet b/d Canine); a behaviour enrichment program including daily learning tasks, environmental enrichment and increased exercise; and a combination of the two strategies were compared in ageing beagle dogs (n=48), with an additional comparison of the fortified food versus a control food in young beagles (n=17).
- In the aged dogs, after one and two years, the combination of the fortified food with the behavioural enrichment program was the most effective in promoting accurate learning. Behaviour enrichment was most effective in reducing the number of errors made by the dogs while doing the discrimination learning task, and both dietary fortification and behavioural enrichment reduced the number or errors while doing the reversal learning task (Figure 1).
- In the young dogs, b/d Canine had no effect on any of the learning types compared with the control food.
- These results suggest that food fortified with antioxidants may help reduce signs of cognitive decline associated with ageing and is most effective when combined with behaviour enrichment.

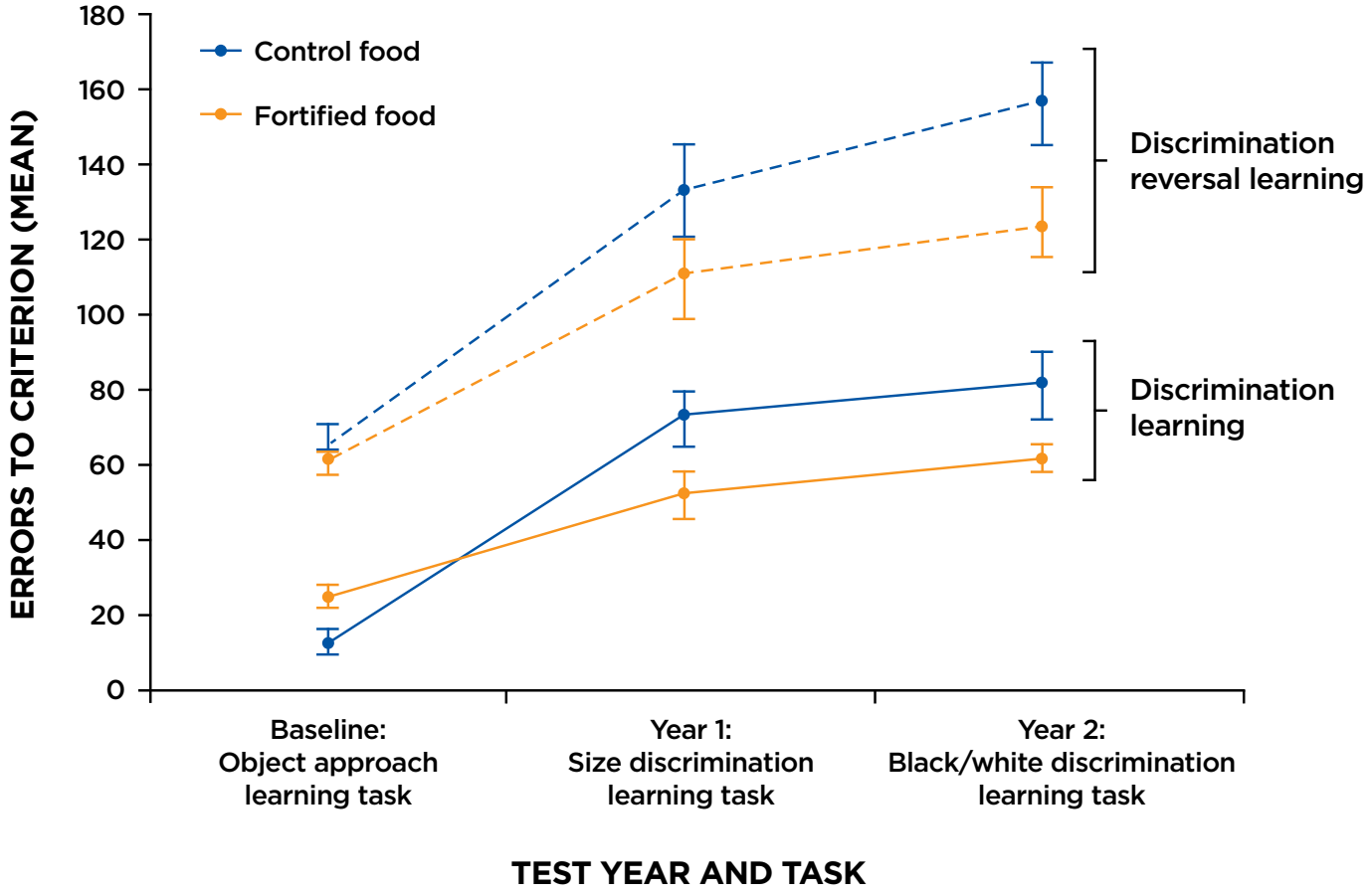

Figure 1. Performance on tasks as a function of antioxidant fortification in aged dogs that received behavioural enrichment. Graph demonstrates the number of errors made by dogs eating the test and control foods before successfully completing each learning task. Solid lines represent a simple size discrimination learning task completed by dogs after one year on the test or control food. Dashed lines represent more complex learning of a black/white discrimination learning task completed after two years on the foods.

Data are presented as means and standard errors.

Baseline assessment: object approach learning task.

Year 1 assessment: size discrimination learning task started ~20 months following baseline testing and ~1 year after the start of the treatment phase and evaluated ability to learn to distinguish two objects that differed only in size to locate a food reward.

Year 2 assessment: black/white discrimination task started ~2 years after the start of the treatment phase and dogs were presented with two blocks that were identical in size and shape but differed in colour, with one object painted black and the other white. The dogs were trained to approach one of the two to obtain a food reward.

Can a fortified food affect the behavioural manifestations of age-related cognitive decline in dogs?

Dodd CE, Zicker SC, Jewell DE, et al.

Veterinary Med. 2003;May:396-408.

KEY POINTS:

- In this multicenter, prospective, double-blind, controlled study, adult dogs (n=142) were randomised to either a complete and balanced adult maintenance food (control) or a similar food fortified with antioxidants (vitamins C and E), mitochondrial cofactors (α-lipoic acid, L-carnitine) and Omega-3 fatty acids (docosahexaenoic acid [DHA], eicosapentaenoic acid [EPA]) (Hill's Prescription Diet b/d Canine); clinical features of age-related behaviour changes were assessed using a standarised questionnaire completed by pet owners at enrollment, day 30 and day 60.
- During the 60-day feeding period, owners of dogs fed b/d Canine reported significant improvements in 14/16 (88%) individual attributes of behaviour compared with 4/16 (25%) for dogs fed the control food (***P***<0.05 difference). Notably, the dogs fed b/d were reported to have significant improvements in the areas of family recognition (***P***=0.016 difference), animal recognition (***P***=0.047 difference), agility (***P***=0.003 difference) and compulsive behaviours (***P***=0.028 difference compared to the owner-reported behaviours of dogs fed the control food).
- These results confirm that a fortified food containing antioxidants, vitamins C and E, α-lipoic acid, L-carnitine and Omega-3 fatty acids from fish oil can ameliorate the signs of CDS, thereby improving the overall well-being of ageing dogs.

DEGENERATIVE JOINT DISEASE

Evaluation of the Effects of Dietary Supplementation with Fish Oil Omega-3 Fatty Acids on Weight-Bearing in Dogs with Osteoarthritis

Roush JK, Cross AR, Renberg WC, et al.

J Am Vet Med Assoc. 2010;236(1):67-73.

KEY POINTS:

- Dogs (n=38) from two university veterinary clinics were randomised to either a control food (complete and balanced food for adult dogs) or a test food (Hill's Prescription Diet j/d Canine) rich in Omega-3 fatty acids from fish oil, then evaluated for signs of DJD with force-plate analysis and owner-completed questionnaires.
- At the conclusion of the 90-day feeding trial, 82% of dogs with DJD fed j/d Canine showed increased weight-bearing ability as assessed by mean peak vertical force.
- Based on clinical orthopedic examinations, dogs fed j/d Canine for 90 days exhibited a reduction in pain when affected joints were palpated, in contrast with dogs fed the control group that did not experience this improvement.

Multicenter Veterinary Practice Assessment of the Effects of Omega-3 Fatty Acids on Osteoarthritis in Dogs

Roush JK, Dodd CE, Fritsch DA, et al.

J Am Vet Med Assoc. 2010;236(1):59-66.

KEY POINTS:

- Dogs (n=127) with osteoarthritis recruited from private veterinary clinics were fed either a control food (complete and balanced adult food) or a test food (Hill's Prescription Diet j/d Canine) containing a 31-fold increase in total Omega-3 fatty acids from fish oil and a 34-fold decrease in Omega-6 to Omega-3 ratio compared with the control food for 6 months; dog owners completed questionnaires to assess their pet's arthritis, and physical examinations were performed and blood samples were collected throughout the feeding period.
- Dogs fed j/d Canine had significantly (***P*** < 0.001) higher serum concentrations of total Omega-3 fatty acids at weeks 6, 12 and 24 than dogs fed the control food.
- Dogs fed j/d Canine had significantly improved ability to rise from a resting position (***P*** = 0.033) and play (***P*** = 0.011) at 6 weeks as well as improvements in walking at 12 and 24 weeks, as assessed by owners, compared with the dogs fed the control food.

Summary

Hill's Prescription Diet Brain Care + j/d Canine combines the nutrition of two important therapeutic foods for dogs with Cognitive Dysfunction Syndrome and/or Degenerative Joint Disease. It has the nutritional attributes of Hill's Prescription Diet b/d, clinically proven to improve signs of CDS, and j/d Canine, shown in over 200 case studies to improve mobility in as little as 21 days in dogs with DJD.[14-17]

Hill's Prescription Diet j/d	Hill's Prescription Diet b/d
Significantly improved mobility	Reduced signs of canine cognitive dysfunction in ageing dogs
Achievement of increased serum Omega-3 fatty acid concentrations	Significant owner-noted improvements in family recognition, agility, and reduction in compulsive behaviours

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