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PLATINUM PERFORMANCE™ CANINE HEALTH SERIES

3

Diet, Health, and Defense Against Inflammation

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Every function in a dog's body is controlled by genes, and nutrition significantly affects how these genes are expressed. This area of study, called nutrigenomics, is also being investigated in humans with chronic diseases.¹⁸ An area of nutrigenomics that is particularly important to Platinum Performance™ is the effect of diet on the level of inflammation in the body and its role in the development or progression of disease.

Cytokines

Inflammation is a normal response to infection and injury. However, chronic, excessive, or inappropriate inflammation has been linked to disease in a variety of species.¹⁹ Cytokines are a family of proteins that help regulate inflammation. Interleukin-1beta (IL-1 beta) is a pro-inflammatory cytokine involved in the body's defense against microbial attack. However, IL-1 beta is also implicated in the pathogenesis of various immune-mediated diseases in dogs. For example, IL-1 beta is significantly over-expressed in skin lesions from dogs with atopic dermatitis²⁰ and has been associated with the degree of gastric fibrosis in dogs with gastritis.²¹ IL-1 beta also contributes to the pathogenesis of arthritis, as evidenced by its role in the upregulation of enzymes that degrade structural components of joints.²² Furthermore, expression of IL-1 beta is increased in synovial membrane and fluid of dogs with both rheumatoid arthritis and osteoarthritis.^{23,24} Increases in IL-1 beta have been associated with other

canine diseases and disorders, including heart failure distemper,^{26,27} ischemic-induced tissue damage,²⁸ and lymph disorders.^{29,30}

In contrast to IL-1 beta, some cytokines have anti-inflammatory effects. For example, Interleukin-10 (IL-10) is responsible for attenuating and terminating inflammatory responses.³¹ As evidence for its importance in disease, it has been reported that a lack of up-regulation of IL-10 may contribute to the initiation and progression of canine distemper,³² immune-mediated polyarthrititis,³³ and osteoarthritis.³⁴

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Inflammation and Therapeutic Nutrition

Joints: Inflammation is a major catalyst for the breakdown and destruction of the structural components of joints.¹ To control inflammation and manage joint disorders in dogs, many veterinarians recommend increasing the intake of omega-3 fatty acids.^{2,3} In support of this concept, the results of one study show that supplementation of dogs with inflammatory joint disease with omega-3 fatty acids reduces the presence of inflammatory markers within the joint.⁴

Allergy: Allergic reactions are generally characterized by an immune-mediated inflammatory response to an often-benign stressor. Atopic dermatitis, the most prevalent allergic condition in dogs, is a response to environmental factors such as dander, molds, dust mites, and pollen. The pruritis commonly noted in dogs with atopic dermatitis has been reduced by supplementing the diet with omega-3 fatty acids.¹⁷

Cognition: Specific types of cognitive dysfunction and decline have been linked to the increasing levels of inflammation that occur in the aging process.¹⁰ Dietary supplementation with omega-3 fatty acids protects against various types of cognitive decline^{11,12} and improves learning in mice,^{13,14} rats,¹⁵ and dogs (unpublished data).

Renal Disease: Renal disease, a condition for which dietary modifications are generally prescribed, is common in both young and old dogs. Supplementation of these animals with omega-3 fatty acids has helped maintain renal function.¹⁶

Cancer: Inflammation is an important component of the tissue destruction caused by cancer.⁵ This fact has resulted in many investigations on the beneficial effects of omega-3 fatty acids on these chronic, and often terminal, diseases.⁶⁻⁸ In one study, dogs with lymphoma that were supplemented with omega-3 fatty acids, in conjunction with traditional chemotherapeutic agents, had increases in both disease-free and survival times.⁹

Omega 3 and Omega 6 Fatty Acids

In general, omega-6 Fatty Acids (FAs) and their derivatives have pro-inflammatory effects; whereas omega-3 FAs and their metabolites are less inflammatory or have anti-inflammatory effects. Several studies have examined the effect of omega-3 FAs on the inflammatory process of wound healing and skin disorders, such as atopic dermatitis, in dogs. For example, reducing the ratio of omega-6 to omega-3 FAs in a canine diet resulted in a reduction in the production of prostaglandin E2, an inflammatory mediator.³⁵ In another study,³⁶ the omega-3 FA, docosahexaenoic acid (DHA), reduced production of inflammatory factors by mastocytoma cells, which are used as a model for the mast cells involved in canine atopic dermatitis. Due to the anti-inflammatory effects of omega-3 FAs, several investigators have proposed that dogs with osteoarthritis should receive additional omega-3 FAs in their diet.^{2,37} Results from studies in humans and rats suggest that the inflammatory component of certain gastrointestinal diseases could be modulated or prevented by dietary supplementation with omega-3 FAs.³⁸

To date, few studies exist characterizing the effects of omega-3 FA supplementation on cytokine production in dogs exist. Based on studies in other species, however, one would presume the anti-inflammatory effects linked to ingestion of these FAs are due to changes in expression of IL-1 beta and IL-10. For example, supplementation with or an increased intake of omega-3

FAs in humans decreases IL-1 beta expression³⁹⁻⁴¹ while simultaneously increasing production of IL-10.⁴²⁻⁴⁴ Similar results have been seen in laboratory animals.⁴⁵⁻⁴⁷

Research on Supplementation

To investigate potential effects of supplementation with Platinum Performance™ Canine on inflammatory markers, researchers at the University of California at Davis conducted an interventional trial comparing expression of various cytokines in dogs. For 6 months, dogs consumed a regular chow diet or the same diet supplemented with Platinum Performance™ Canine and Platinum Antioxidant™. White blood cell RNA was isolated from dogs before and after the feeding trial, and cytokine expression was measured. Dogs supplemented with Platinum Performance™ had a 71% lower expression of the pro-inflammatory cytokine IL-1 beta (Figure 1) and a 40% greater expression of the anti-inflammatory cytokine IL-10 (Figure 2).

Conclusion

Supplementing canine diets with Platinum Performance™ Canine and Platinum Antioxidant™ decreased expression of the pro-inflammatory cytokine, IL-1 beta, and increased expression of the anti-inflammatory cytokine, IL-10. Modulating inflammation through cytokine expression may help regulate the inflammatory component of various canine diseases and disorders, which may be achieved by maintaining dogs on an anti-inflammatory diet.

Figure 1. IL-1 beta Expression Among Dogs Supplemented with Platinum Performance™ and Non-Supplemented Dogs

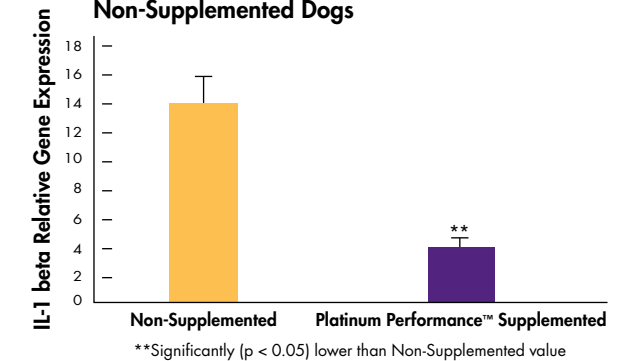
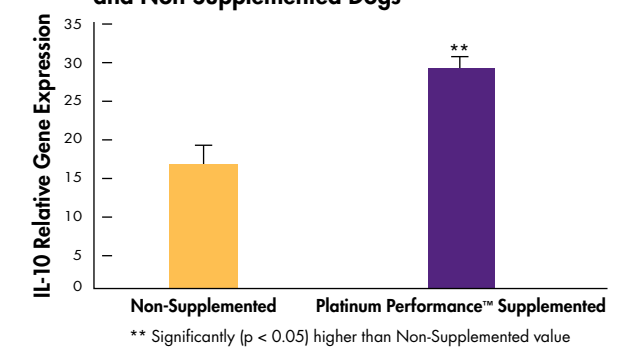


Figure 2. IL-10 Expression Among Dogs Supplemented with Platinum Performance™ and Non-Supplemented Dogs



Putting it Into Practice

- Reduce dog foods with excessive omega-6 FAs as compared to omega-3 FAs.
- As a preventive measure, supplement canine diets with omega-3 FAs and antioxidants such as those provided in Platinum Performance™ Canine and Platinum Antioxidant.