

Supplementation for Allergy Support & Coat Health

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Allergies are immune disorders characterized by hypersensitivity to specific substances (allergens) and that result in an excessive inflammatory response. Most commonly, allergic reactions affect the skin and respiratory airways in horses and generally develop in response to exposure to molds, spores, insect bites, and certain proteins present in pasture grasses. Due to the ubiquitous nature of these allergens, maintaining a healthy immune system is a critical factor in reducing the incidence of allergic reactions in horses. In addition to a balanced diet, supplementation with specific nutrients can help support the immune system and, thereby, reduce the occurrence of common allergies and other immune-related reactions. Examples of these immune-supporting nutrients include certain fatty acids, trace minerals, vitamins, thymus extract, and quercetin.

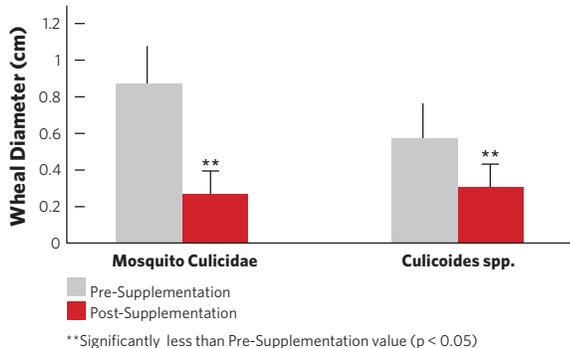
Omega-3 and Omega-6 Fatty Acids

Fatty acids are major constituents of lipid membranes and nervous tissues and are also essential for normal skin structure and function. While there are several different classes of fatty acids, currently there is much interest in the polyunsaturated omega-6 and omega-3 families. Metabolites of the omega-6 fatty acids induce strong inflammatory responses, which have been linked to various chronic disorders. In contrast, metabolites of omega-3 fatty acids have weak or low-inflammatory and even inflammatory-resolving effects that protect against many chronic diseases. Although the horse's fatty acid intake may be adequate to meet NRC requirements, very often the polyunsaturated fatty acids included in the diet are in the incorrect ratio or oxidized and become rancid. These rancid fatty acids lose their nutritional value, impair the absorption of fat-soluble vitamins, adversely affect feed palatability, and induce additional oxidative stress in the animal. Therefore, ingesting rancid fatty acids could result in a dull or dry coat, hair loss, scaly skin, and a predisposition to infections and allergic reactions.

An expanse of research from humans and other animals suggests that supplementing the diet with long chain omega-3 fatty acids, such as docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), controls allergic responses by moderating the immune and inflammatory state of the animal.¹⁻³ DHA and EPA compete with the pro-inflammatory omega-6 fatty acid arachidonic acid as a substrate for lipoxygenase enzymes. This results in a more positive balance between the 4 and 5-series leukotrienes (LTB₄ and LTB₅). As noted in other animals, arachidonic acid-derived LTB₄ is a key player in allergic skin reactions and bronchial asthma.⁴⁻⁹ EPA and DHA-derived LTB₅, on the other hand, exhibits lower potency related to these hypersensitivity reactions.¹⁰ Supplementation of the diet with flaxseed or flax oil—a plant-based source of the omega-3 fatty acid alpha-linolenic acid which is a precursor to both EPA and, to a lesser extent, DHA—also supports a better balance between LTB₄ and LTB₅.¹¹ As evidence for the positive effects of these omega-3 fatty acids, one study showed allergic skin reactions to the extract of *Culicoides*

spp. were reduced in horses after 42 days of flaxseed supplementation.¹² An in-house trial followed allergic skin reactions to intradermal allergen injections in horses receiving a supplement that contains flaxseed and flax oil, algal DHA, and various micronutrients.* All reactions were significantly reduced after 11 weeks of supplementation. For example, the size of wheals that developed in response to injection of a Mixed Grasses antigen was decreased by more than 50% at 2 and 4-hours post-injection in horses ingesting the supplement when compared to their values before supplementation. Furthermore, the mean reaction to the Mite-Lepidoglyphus Destructor antigen was nearly 40% smaller when measured 4-hours after the injection. Similar results were noted in response to the Mosquito Culicidae and Culicoides spp. antigens (Figure 1).

Figure 1. Allergic Response to Mosquito Culicidae and Culicoides spp. Antigens Before and After 11 Weeks of Supplementation with Omega-3 and Miconutrient Product*



In addition to regulating leukotriene synthesis, fatty acids control the synthesis and activities of a family of inflammatory-modulating proteins called cytokines. Several cytokines are implicated in and often inducers of allergic reactions. Tumor necrosis factor-alpha (TNF- α) plays a role in the persistence of the inflammatory response in heaves-affected horses.¹³ Others have shown that higher prevalence of horses with heaves have increased concentrations of TNF- α and interferon-gamma (IFN- γ) than do horses not affected by heaves.^{14,15}

*Platinum Performance® Equine Wellness and Performance Formula

Interleukin-6 (IL-6) is another cytokine implicated in the pathophysiology of asthma and is increased in horses with induced asthma.¹⁶ Researchers from the University of California at Davis compared expression of cytokine genes in horses fed a diet of hay and grain to expression of the same genes in horses fed hay and an omega-3 and micronutrient supplement* for 6 weeks. Expression of genes for TNF- α and IL-6 were lower by 69% and 85%, respectively, in the supplemented horses when compared with the non-supplemented horses (Figures 2 and 3). In an observational study conducted by the same research group, horses fed this hay and supplement diet had lower expression of IFN- γ and TNF- α genes than horses eating other feeds (data not shown).

Figure 2. TNF-alpha Gene Expression in Horses Consuming a Hay + Omega-3 and Micronutrient Supplemented* Diet vs Horses Consuming a Mixed Grain and Hay Diet

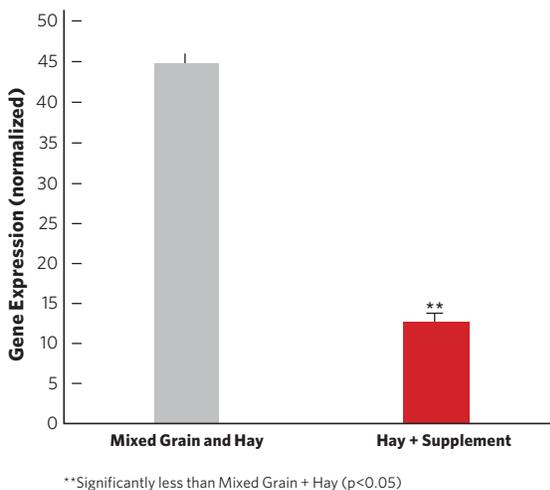
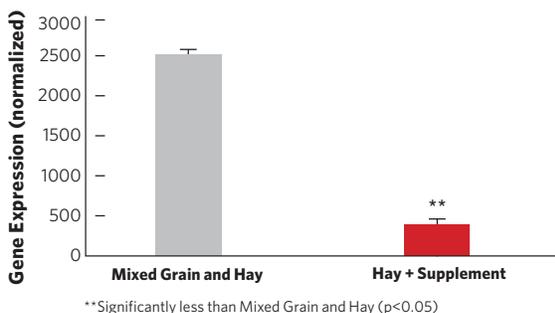


Figure 3. IL-6 Gene Expression in Horses Consuming a Hay + Omega-3 and Micronutrient Supplemented* Diet vs Horses Consuming a Mixed Grain and Hay Diet



Other Vitamins and Minerals

Several vitamins and minerals can offer support against skin and allergic diseases in horses. For example, vitamin E is a natural, potent, fat-soluble antioxidant that stabilizes cell membranes and protects against oxidative damage.¹⁷ Vitamins A and D decrease the expression of proteins implicated in inflammatory conditions of the skin.^{18,19} B vitamins help prevent dull hair coats, loss of hair, and the development of ulcers around the mouth and certain pruritic conditions in other animals.²⁰ In tissues with rapidly dividing cells—such as the skin—zinc has a critical role because it acts as a cofactor in DNA synthesis. Zinc is important for the growth and repair of the skin and supports anti-inflammatory and immune-enhancing activities.^{21,22}

Thymus Extract

Thymus extract is purified from the calf thymus gland, an organ that plays a major role in activating and balancing the immune system. This extract promotes the maturation and activity of specific immune cells that help control allergic responses, infections and certain cancers.^{23,24} Thymus extract has been shown to be beneficial for people with respiratory infections, bronchial asthma, and food allergies and other immune-mediated dysfunction.²⁵⁻²⁹ Although the mechanisms responsible for improvements in immune function after supplementation with thymus extract remain undetermined, they may be in part due to decreases in concentrations of IgE—an immunoglobulin associated with allergic reactions—and increases in IgA—an immunoglobulin that helps prevent recurrent infections and allergies. Both of these responses have been reported following thymus extract supplementation in humans.^{25,26,29}

Quercetin

Quercetin is a naturally-occurring polyphenolic plant compound, categorized as a flavonol, that is widely used for its antioxidant and anti-inflammatory properties. Quercetin inhibits both lipoxygenase

and cyclooxygenase,³⁰ key enzymes that convert arachidonic acid into strong pro-inflammatory mediators. Quercetin modulates the branch of the immune system called the complement system,³¹ which is implicated in autoimmune disorders and other exacerbations of the immune response. Quercetin is a natural antihistamine³² and has been shown in animal models to treat asthma and other inflammatory airway conditions as well as anaphylactic shock.³³

Summary

Allergic reactions are characterized by immune-mediated inflammatory responses to allergens that may be ubiquitous in nature. Consequently, allergic reactions can be more than just a nuisance to the horse. While providing a balanced diet is critical, especially as the skin regenerates rapidly and provides the “first line” of defense against environmental factors and invading organisms, supplementation of the diet with omega-3 fatty acids, antioxidants, vitamins, trace minerals and immune-enhancing nutrients can provide further support for the health and well-being of the horse.

Putting it into Practice

- Reduce the intake of feeds having an imbalance between omega-3 and omega-6 fatty acids.
- As a preventive measure against skin and other allergic problems, supplement the horse's diet with omega-3 fatty acids, trace minerals, vitamins and antioxidants.
- During times of high allergen exposure or allergic reactions, supplement the diet with DHA and the immune-enhancing nutrients, including purified calf thymus extract and quercetin.

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