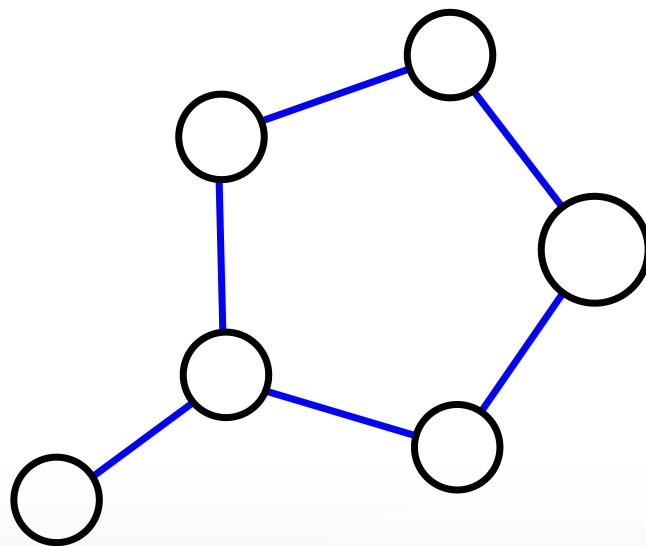




Beyond Basic Nutrition:
Optimizing Equine Health with
Zinpro® Performance Minerals®

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Why Trace Minerals?

Trace minerals such as zinc, manganese and copper are essential factors in equine physiology, serving as cofactors in hundreds of enzymatic reactions that drive cellular metabolism, tissue repair and antioxidant defense. In fact, trace minerals are critical elements supporting equine health, wellbeing and performance, impacting lipid metabolism, immune function, keratin synthesis and collagen formation.

Horses have a daily requirement for seven trace minerals.¹ Other trace minerals such as chromium are required by the horse, but specific dietary requirements have not been fully determined. While some of these are supplied in the forage component of the diet, it is important that requirements be met by supplementation with high-quality, bioavailable mineral sources.

Zn Zinc

Cu Copper

Mn Manganese

Se Selenium

Fe Iron

I Iodine

Co Cobalt

Cr Chromium



WHY TRACE MINERALS?

(CONTINUED)

Zn Zinc

Zinc is critical in supporting equine immune function, enzyme production and skin health. Zinc also plays an important role in the regulation of hoof growth, promoting integrity and new tissue development. Zinc deficiency is more common than toxicity in horses, however intake must be controlled to ensure that zinc to copper ratios range from 3 : 1 to 5 : 1 in the total diet to avoid antagonism.²⁻⁴

Cu Copper

Copper is a necessary trace mineral that should be supplemented in the diet due to inadequate and variable levels in most forages and grains. Copper works in conjunction with zinc in the equine body to support collagen formation, an important factor in hoof health and coat quality. Copper is also required to support bone health and is a regulator of erythropoiesis (red blood cell formation). Horses are tolerant of high levels of dietary copper, but care should be taken to ensure that zinc to copper ratios are maintained appropriately.²

Mn Manganese

Daily supplementation of manganese is necessary due to low levels in forages and a relatively low bioavailability of naturally occurring manganese in most hay and pasture commonly fed to horses. Manganese functions in the equine body to support bone development and repair, along with supporting cartilage health and enzyme activity. These functions are critical to support joint health and recovery in equine athletes and young, growing horses. Manganese is also an important regulator of oxidative stress as it protects cells from oxidative damage commonly caused by free radicals.^{2,4}

Se Selenium

Selenium levels in grains and forages reflect the selenium content in the soil in which they are grown. Certain geographies are known to have higher or lower levels of selenium. Selenium supplementation is often necessary to meet requirements; however, special attention must be given to the overall selenium content of the equine diet as toxicities are possible. Selenium works with vitamin E as an antioxidant, protecting the body from oxidative damage caused by free radicals. Selenium is an important regulator of immune function, along with playing a role in supporting cell membrane integrity.²

Mineral	Deficiency Symptoms
Zinc	• Poor coat condition • Poor hoof growth • Slow wound healing
Copper	• Reduced fertility • Poor hoof growth • Weak connective tissue • Abnormal bone and joint development
Manganese	• Poor growth • Joint dysfunction • Impaired reproductive health
Selenium	• Muscle weakness • Ataxia • Immune suppression • Poor hoof quality • Poor skin and coat health

WHY TRACE MINERALS? (CONTINUED)

Fe Iron

Iron levels in forages and grains are variable and the bioavailability of naturally occurring forms of iron is low and inconsistent. Iron, as a component of hemoglobin in red blood cells, is necessary for oxygen transport and muscle function. Exercise, as is common in performance horses, raises oxygen demand, resulting in an increased need for iron sources that are bioavailable and consistent. Anemia, or iron deficiency in horses, is well-documented and can be caused by inadequate dietary iron, high parasite load and infection.²

I Iodine

Iodine levels are commonly higher in grains than in forages. Iodine requirements are most commonly met in horses through supplementation of iodized salt, which should be provided daily to horses to meet sodium (Na) and chloride (Cl) requirements. Iodine is necessary to maintain thyroid function in horses, which in turn supports energy metabolism, growth and muscle function.²

Co Cobalt

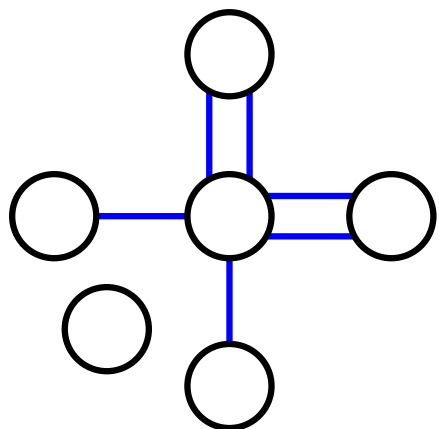
Cobalt is necessary to support *in vivo* production of vitamin B12 (cobalamin). Fiber-digesting microbes that inhabit the equine hindgut require cobalt to enhance fiber digestion, providing necessary volatile fatty acids (VFAs) to support equine energy demands. Certain bacteria found in the cecum and the colon of the horse utilize dietary cobalt to produce vitamin B12, allowing the horse to meet its daily requirement for this important vitamin. Cobalt requirements in horses are typically very low and are often met by forage.^{2,5}

Cr Chromium

Chromium has recently received more interest in equine nutrition due to its role in supporting optimal energy metabolism. While recognized as an important trace mineral, specific chromium requirements in horses have not been identified. In horses, chromium is an important regulator of insulin and is thought to facilitate glucose clearance from the blood into tissues such as muscle and adipose.⁶

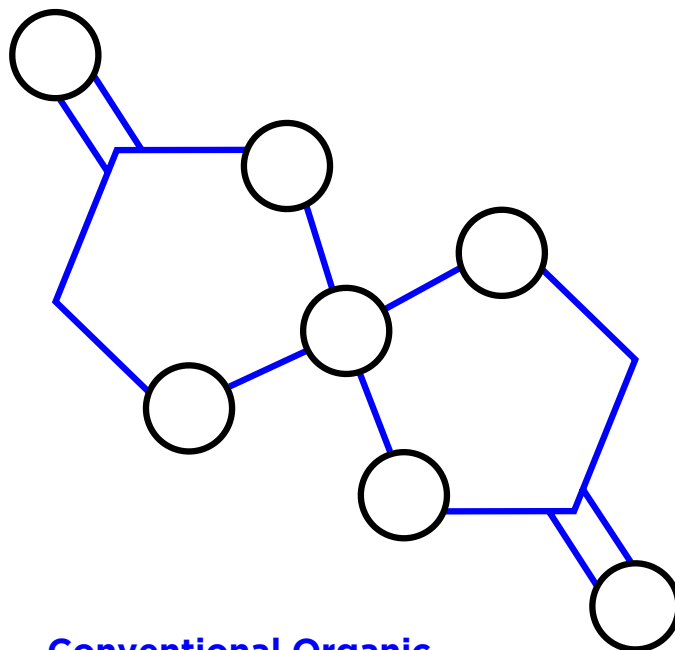


Types of Trace Minerals



Inorganic Trace Minerals

These commonly include oxides, sulfates, carbonates or hydroxychlorides. Inorganic trace minerals are widely used due to the fact that they are inexpensive. **However, they are poorly absorbed compared to other sources, potentially leading to mineral deficiencies and reduced overall health and performance.** Inorganic minerals may be reactive in the equine gut, where they can easily bind or compete with other dietary components (antagonists like phytates, folic acid, fiber or other minerals), rendering them largely unavailable for absorption. Many times, inorganic minerals are simply excreted before the animal can utilize them. This leads to inconsistent bioavailability and suboptimal biological impact, often requiring higher levels to be incorporated into feeds and supplements to meet the true physiological need of the horse. Additionally, free ions from inorganic mineral sources, such as copper and iron, can pose health risks due to their pro-oxidant effects.⁷⁻¹²



Conventional Organic Trace Minerals

These minerals are commonly referred to as chelates or complexed minerals due to the fact that they are typically bound to organic ligands such as amino acids, peptides or proteins. **While they generally offer improved stability and absorption compared to inorganic forms, conventional organic trace minerals such as proteinates and glycinate can exhibit variability in performance.** Factors such as bonding strength, solubility and absorption mechanisms may influence their ability to consistently deliver functional health benefits. In some cases, weaker chemical bonds may lead to dissociation in the acidic environment of the equine stomach, potentially reducing bioavailability. This underscores the importance of selecting organic trace minerals with proven structural integrity and absorption pathways to ensure nutritional outcomes.¹³



Zinpro Performance Minerals

Zinpro Performance Minerals represent a distinct and differentiated sub-class of organic trace minerals. These mineral amino acid complexes are designed not just to meet the nutritional requirement of horses, but for functional health outcomes.

Zinpro Performance Minerals require us to think differently about what trace mineral supplementation means. Performance benefits, such as mobility support, promotion of gut health and enhancement of skin and coat health, are foundational differences in Zinpro Performance Minerals compared to conventional organic trace minerals.





The health and performance benefits of Zinpro Performance Minerals are achieved through a patented molecular structure that enables:

Targeted Absorption

Zinpro Performance Minerals bypass common antagonists in the digestive tract and utilize preferred amino acid transport pathways for efficient uptake, ensuring the optimal level of each mineral reaches the bloodstream and target tissues.

Structural Soundness and Ideal Solubility

Zinpro Performance Minerals are bound within a five-membered ring, coupled with unique chemical properties that provide structure and stability while promoting solubility, to ensure the mineral-amino acid complex stays intact and soluble until it reaches the optimal site of absorption.

Optimal Cellular Utilization

Once absorbed, Zinpro Performance Minerals are readily available for intracellular enzymatic activity, supporting processes like keratinization, collagen synthesis and immune modulation—functions that are critical for skin integrity, hoof growth & strength and coat quality.

Consistent, Measurable Outcomes

Zinpro Performance Minerals are backed by multiple peer-reviewed research studies in horses demonstrating improvements in hoof health, epithelial integrity, gastric health and performance.





Questions to Ask When Evaluating Trace Mineral Sources:

1

Are they fully bioavailable and efficacious or simply being used to meet minimum requirements?

2

Will they remain stable and appropriately complexed through the acidic environment of the equine stomach?

3

Can the claims associated with the trace minerals be verified by peer-reviewed research trials in horses?

4

Could antagonism in the gut or reactivity with other ingredients in premixes be limiting their effectiveness?

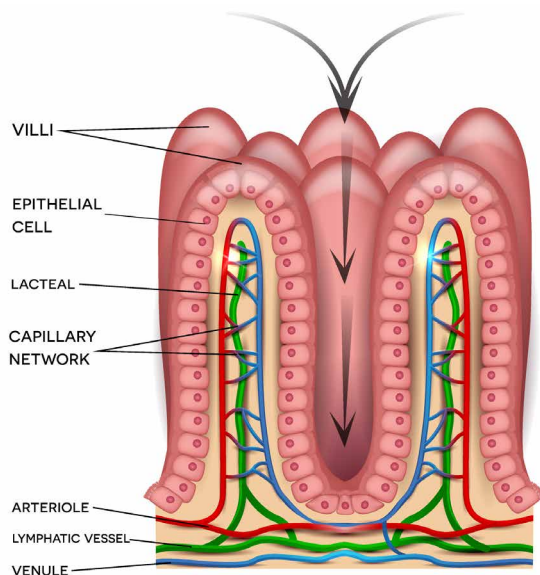


Figure 1. Proper absorption of trace minerals is regulated by the enterocytes that make up the villi of the small intestine. Improved mineral bioavailability results in optimal health and performance outcomes.

HOW ARE ZINPRO PERFORMANCE MINERALS ABSORBED?

Zinpro Performance Minerals utilize a unique mode of absorption compared to inorganic trace mineral sources. The distinctive molecular structure of Zinpro Performance Minerals, in which they are bound to a single amino acid in a 1 : 1 ratio of mineral to amino acid, leverages the horse's requirement for amino acids, bypassing typical trace mineral transporters and utilizing amino acid transporters to promote increased cellular uptake. Once absorbed, the amino acids are available to be utilized by the horse, further supporting overall health and performance.

Commitment to Quality

MEET OUR ZINPRO EQUINE STRATEGY TEAM



Dr. Robert Jacobs

**Global Equine Technical Specialist,
Equine Strategy Team Lead**

With over a decade of experience conducting equine physiology research, Robert has developed numerous equine feeds and supplements and has conducted hundreds of equine nutrition studies. In his role, he supports customers globally in their development of research-backed feeds and supplements for horses. Additionally, Robert works with our world-class research and development team to conduct equine research aimed at better understanding the interplay between equine nutrition and performance.



Caitlin Gagnon, MBA

North America Marketing Manager

A horse woman at heart, Caitlin promotes the equine business through the development of innovative marketing campaigns and supports customers in the development of marketing materials, support documents, packaging and surround materials. Caitlin and her team provide world-class marketing support, enabling our customers to leverage Zinpro's vast market reach.



Erik Swensson

Account Specialist

With over 25 years in the animal agriculture industry, Erik has a wealth of knowledge across species. He has a passion for equine and companion animal nutrition and has built relationships with feed manufacturers around the country. Erik's expertise lies in communicating the Zinpro differentiation to customers, enabling them to stand out in a crowded market.

MEET OUR ZINPRO EQUINE STRATEGY TEAM (CONTINUED)



Dr. Laura Amundson

Research and Discovery Lead—Global Pet

As an innovative and passionate physiologist, Laura's focus is in understanding the physiology of joint disease and the nutritional role in supporting optimal outcomes in animals with joint health challenges. Laura has conducted research across multiple species to identify the various mechanisms by which trace mineral supplementation can support joint health and development. She is an industry expert and enjoys educating feed manufacturers and customers.



Joanne Isaacson

Account Manager

A passionate cattlegirl and equine enthusiast who lives and breathes animal agriculture, Joanne understands the unique needs of the equine industry. Joanne focuses her time on building relationships with customers, helping them to explore novel ways to differentiate their products and stand out in a crowded market.



Christy Kitchingman

West District Manager

With wide-ranging responsibilities and territory, Christy is an enthusiastic manager who excites and engages with her team, customers and industry partners. Christy has extensive experience in the lifestyle sector of the animal agriculture industry and a passion for the equine industry.

To connect with the Zinpro Equine Strategy Team or an account manager in your area, please call 1-800-445-6145, email customerservice@zinpro.com or reach out directly to Dr. Robert Jacobs at rjacobs@zinpro.com.



ZINPRO QUALITY PROMISE

Our patented mineral technology and manufacturing process ensures that our products are produced to the highest standards for purity and safety.

Quality

Robust Food Safety Plan that is FSMA compliant

Rigorous supplier approval and monitoring program for all ingredients

Complete ingredient and finished-product testing for potency, uniformity, heavy metals and dioxins

Members of the National Animal Supplement Council (NASC) and qualified as a preferred supplier

Traceability

Complete production and process control of Zinpro-owned, US based plants

Laboratory Information Management System (LIMS) that provides seamless tracking and traceability

Production

Family-owned business with US-based production plants

Continuous manufacturing process monitoring and testing protocol that ensures product consistency, safety and uniformity

On-site analytical testing laboratory and quality control team at every plant

Safety

All product is manufactured in completely ionophore-free facilities, utilizing ingredients and materials sourced from ionophore-free production facilities

All products do not contain any ingredients listed by the U.S. Equestrian Federation (USEF), Horseracing Integrity and Safety Authority (HISA) or Federation Equestre Internationale (FEI) as prohibited or regulated

FEI Clean Sport for Horses Initiative and USEF Safe Sport Compliant

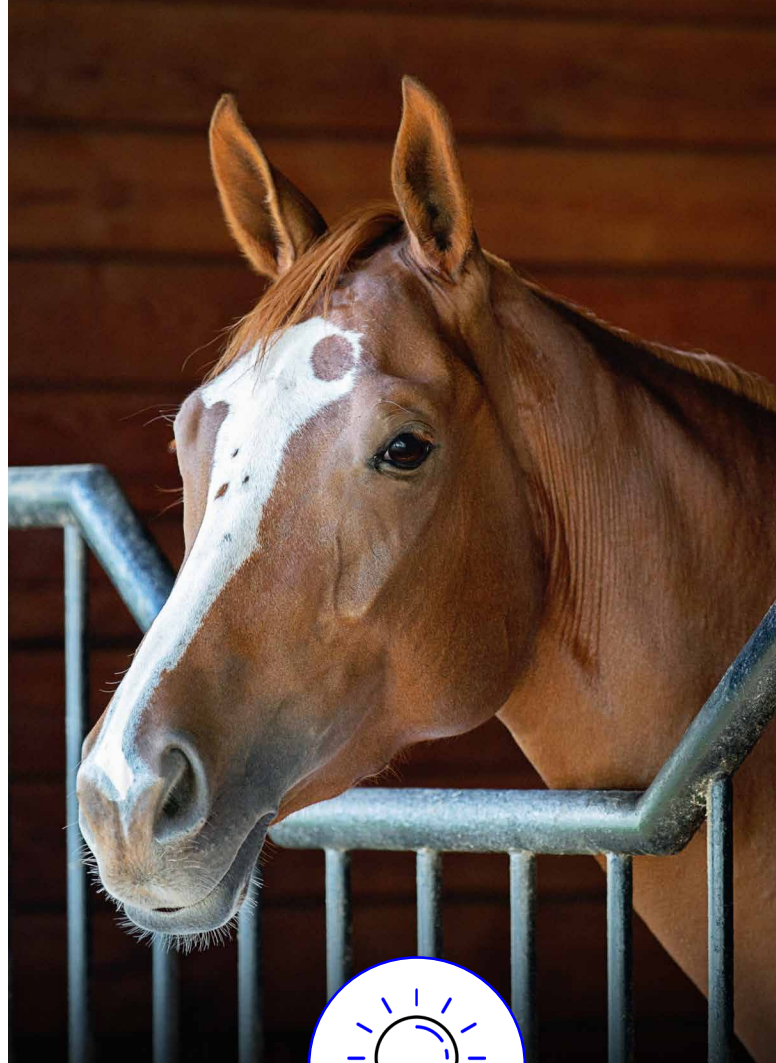
All products contain no Naturally Occurring Prohibited Substances (NOPS) as defined by the British Equestrian Trade Association (BETA)

Research-backed Equine Nutrition

The world of equine feeds and supplements is complex, expansive and often times confusing. Feed and supplement manufacturers are working hard to differentiate themselves in a crowded market to influence horse owners that are increasingly informed, discerning and emotionally invested in their horse's health, performance and wellbeing. Today's horse owner demands transparency and research-backed evidence to support functional claims, resulting in a new platform for equine feed and supplement manufacturers—evidence-based nutrition.

Zinpro Performance Minerals are designed not only to meet the basic requirements for trace minerals in the equine diet, but also to support the physiology of today's performance horse and equine companion. Many trace mineral sources, especially inorganic and conventional organic forms, are often poorly absorbed, resulting in potential decreases in animal performance.¹⁴

Zinpro has maintained a dedication to research-backed feed innovations, and our approach to equine nutrition is no exception. Specifically, our research has focused on mobility, hoof growth, gut health, young horse immune function and coat and hair health.



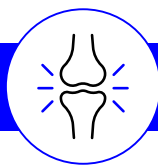
Questions to Ask When Evaluating Trace Mineral Research:

- 1** Has the product's efficacy been tested and validated in horses?
- 2** Are the product's claims supported by equine-specific research?
- 3** Can the product deliver visible, consistent and measurable results?



All horses undergo stressors throughout their lives that have the potential to impact their health and performance. From trailering to performance, training and breeding, horses are inundated with events that may cause increased stress, which can manifest in a variety of ways. Lameness, gastric ulcers and hindgut challenges are the most common signals that horses are experiencing stress that may require veterinary, farrier or nutritional intervention.¹⁵⁻¹⁸

The goal of Zinpro Performance Minerals is to provide horses with the substrates necessary to most appropriately respond to these stressors, limiting their effects on health and performance.



MOBILITY

Mobility concerns affect nearly all horses and are of significant interest to horse owners, veterinarians, farriers and trainers. While nutrition plays a significant role in supporting equine mobility, lameness challenges are multi-factorial and an integrated approach should be taken to address these considerations.

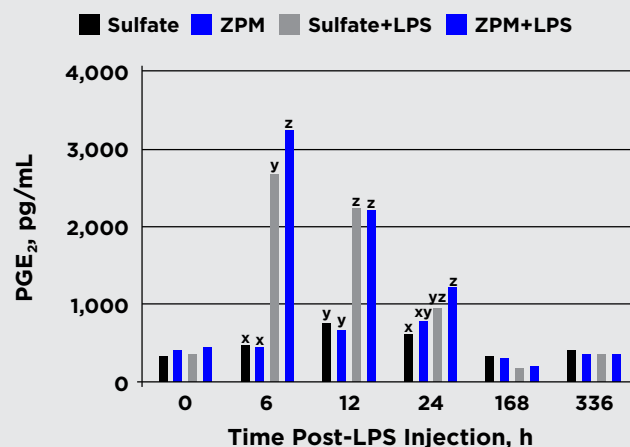
In a study conducted at Texas A&M University, Zinpro researchers sought to determine the effects of trace mineral source on intra-articular inflammation and cartilage metabolism, following an experimentally induced inflammation challenge. In this study, all horses received the same levels of trace minerals, with differences only in source: Zinpro Performance Minerals (ZPM) vs. sulfates.¹⁹

Results from this trial showed:

- ✓ A significantly improved acute inflammatory response
- ✓ Greater repair response to the inflammatory challenge

Overall, the implications from this trial are that horses supplemented with Zinpro Performance Minerals had a more robust pro-inflammatory response during the acute phase of inflammation, followed by appropriate inflammation resolution. This response permitted an increase in new collagen formation, allowing for more timely joint-repair processes.

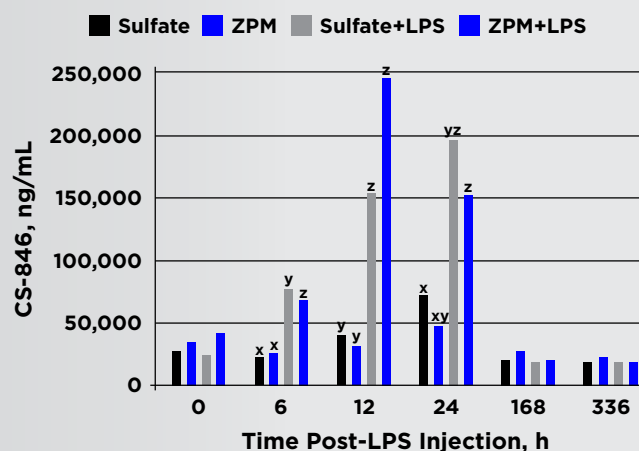
Inflammation: PGE₂ Concentration in Synovial Fluid



*Within a time point, means lacking a common superscript letter differ; Diet $P = 0.13$; Time $P < 0.01$; Diet x Time $P = 0.25$; LPS $P < 0.01$; Diet x LPS $P = 0.17$; Time x LPS $P < 0.01$; Diet x Time x LPS $P = 0.48$

Rapid recognition of an inflammatory challenge may allow horses to respond more appropriately and recover from a challenge more effectively. These data show an improved acute response to inflammation in horses receiving trace minerals as Zinpro Performance Minerals vs. inorganic sulfates.

Aggrecan Synthesis: CS-846 Concentration in Synovial Fluid



*Within a time point, means lacking a common superscript letter differ; Diet $P = 0.61$; Time $P < 0.01$; Diet x Time $P = 0.01$; LPS $P < 0.01$; Diet x LPS $P = 0.39$; Time x LPS $P < 0.01$; Diet x Time x LPS $P = 0.05$

Aggrecan is a critically important proteoglycan component for cartilage structure and overall function of joints. Rapid replenishment of aggrecan following joint injury may allow for a quicker return to performance, reduction in lameness and overall improved performance. These data indicate that horses receiving Zinpro Performance Minerals had an earlier peak (12 h vs. 24 h) and higher overall levels of synovial aggrecan compared to horses receiving inorganic sulfate minerals.



HOOF GROWTH

The equine hoof is a unique and complex structure. Many specialized structures in its anatomy give it the strength needed to meet the physical demands of weight bearing and movement, allowing for the performance that we appreciate in our equine companions. Advancements in the areas of anatomy, nutrition, biomechanics and growth mechanisms are allowing for a deeper understanding of the regulation of optimal hoof growth and development. While nutrition plays a uniquely significant role in hoof maintenance, a coordinated effort by horse owners, veterinarians and farriers is required to realize the full potential of the equine hoof.

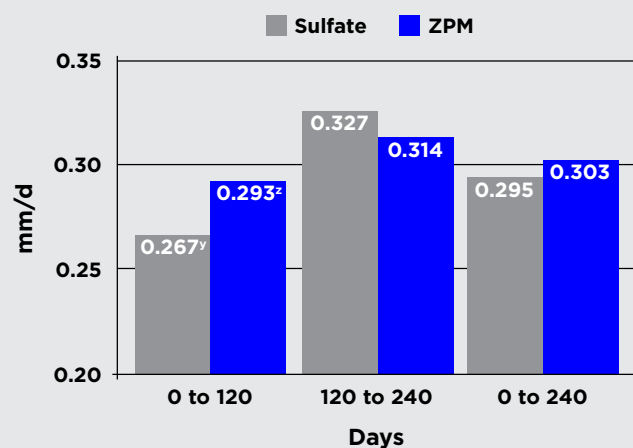
In two separate trials conducted at Colorado State University and the University of Florida, Zinpro researchers sought to understand the implications of the source of trace minerals on hoof growth. In both trials, horses were supplemented with similar levels of trace minerals from either an inorganic sulfate source or as Zinpro Performance Minerals.

Results from these trials showed:

- ✓ **Significantly greater hoof growth**
- ✓ **Improved sole thickness**

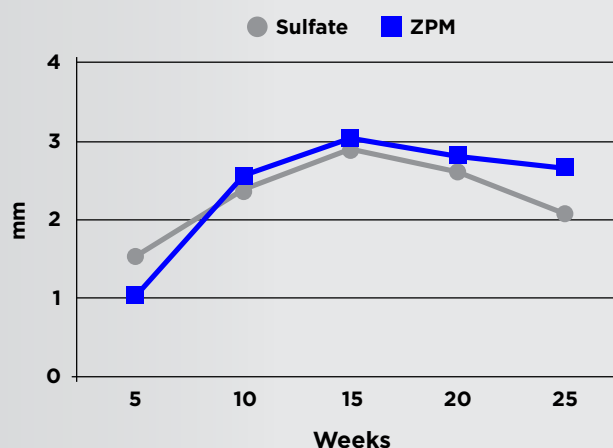
Taken together, these data demonstrate an increase in the bioavailability of Zinpro Performance Minerals compared to inorganic mineral sources. Rapid increases in hoof growth observed in Trial 1 show that horses were more efficiently able to utilize the trace minerals provided in the diet to support optimal hoof growth. In Trial 2, the increase in sole thickness observed at the conclusion of the trial demonstrates that mineral source is critical in providing the necessary substrates for hoof growth and repair. Sole thickness is critical for preventing lameness, maintaining structural function of the foot and for repair and support therapy in cases of hoof disease or damage. Overall, horses provided diets containing Zinpro Performance Minerals had faster growing and healthier hooves compared to those receiving standard inorganic minerals.

Trial 1: Hoof Growth

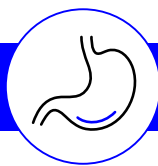


Data from this trial, conducted at Colorado State University, measured daily overall hoof growth over the course of 240 days. Horses fed diets containing Zinpro Performance Minerals had an overall increase in daily hoof growth with a significant increase during the first 120 days of the trial.

Trial 2: Sole Thickness Change from Baseline



Data collected from the second trial conducted at the University of Florida show that horses receiving trace minerals from Zinpro Performance Minerals had a 28% increase in sole thickness at the conclusion of the trial compared to those horses receiving inorganic sulfate-source minerals.



GASTRIC HEALTH

Gastric health challenges are of notable concern to horse owners. It is estimated that up to 90% of performance horses experience discomfort as a result of gastric ulceration. Advances in the understanding of gastric ulceration. Advances in the understanding of gastric disease in horses has elevated our understanding of the physiology of these conditions, providing management suggestions as well as nutritional interventions. Previous research identified an improvement in epithelial integrity in animals consuming Zinpro Performance Minerals.²⁰ To that end, Zinpro researchers sought to understand the role of mineral source on gastric epithelial integrity in horses.

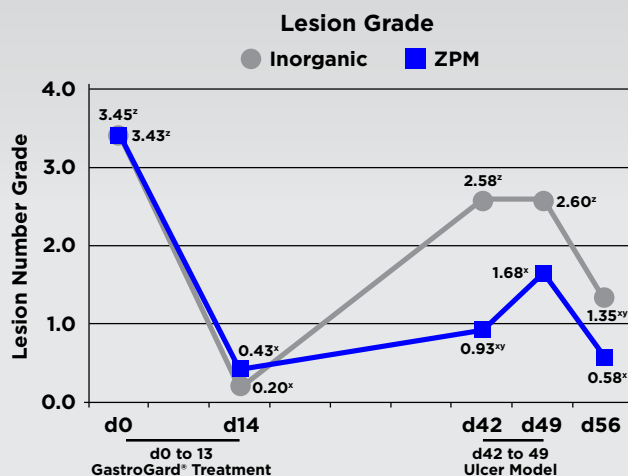
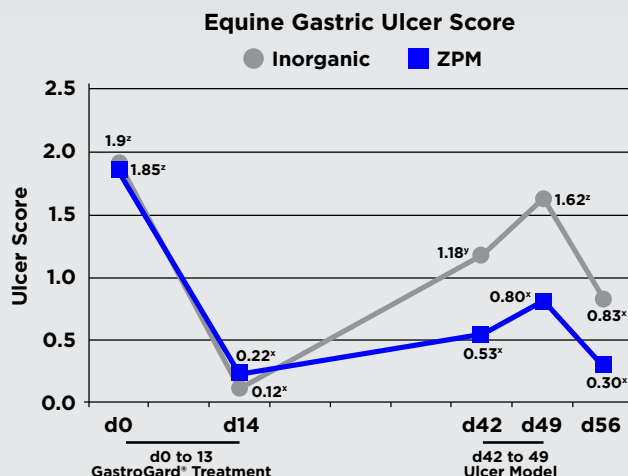
In a trial conducted at Louisiana State University, horses were offered diets containing either Zinpro Performance Minerals or inorganic sulfate source trace minerals at the same levels. During the course of a 56-day dietary treatment, horses underwent a 7-day gastric ulcer induction period to test the effect of trace mineral source on the ability to respond to stressors commonly associated with the development of gastric ulcers. Researchers utilized gastric endoscopy to visualize and score the lesions in the stomachs of the horses at 4 timepoints during the trial.

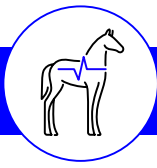
Data from this trial demonstrate that horses receiving trace minerals as Zinpro Performance Minerals had reduced numbers and severity of gastric ulcers as compared to those receiving inorganic sulfate trace minerals. In fact, horses consuming Zinpro Performance Minerals had 50% fewer gastric ulcers and an overall decrease in lesion score compared to the inorganic trace mineral group.

Results from this trial showed:

- ✓ **Reduced Equine Gastric Ulcer Syndrome (EGUS) scores**
- ✓ **Improved response to gastric ulcer induction challenge**

Equine gastric ulcers represent a complex physiological condition that is caused by a multi-factorial confluence of factors. However, it is widely accepted that increased stress results in an increased incidence of gastric ulcers in horses. These data indicate that horses supplemented with Zinpro Performance Minerals are more capable of responding to these stressful conditions, potentially reducing the negative health effects that may result in gastric discomfort.





YOUNG HORSE IMMUNE HEALTH

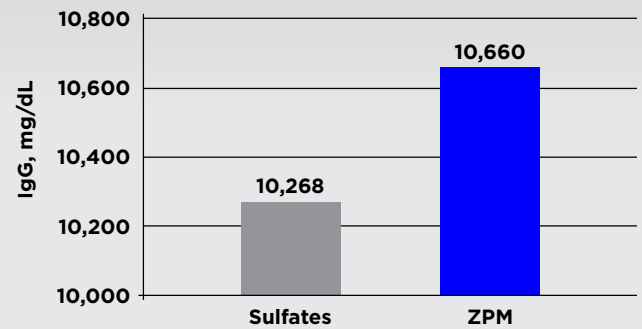
Optimal growth and development in young horses is the result of genetics, management, veterinary care and nutrition. Of utmost importance is the support of the developing immune system of young horses, which allows them to respond to bacterial, viral or other extrinsic challenges. At parturition, neonatal equine immune function is dictated by the success of passive transfer of immunity as the foal consumes adequate quantities of high-quality, immunoglobulin-rich colostrum. Failure of passive transfer often results in the need for veterinary intervention and the administration of hyperimmune plasma to reduce the risks of immune dysfunction and subsequent disease challenges. Nutritional regulation of colostrum development has been a specific focus of Zinpro due to the importance of trace minerals in immune function.

In a series of trials, Zinpro researchers investigated the source of trace minerals on colostrum quality and subsequent immune performance in neonatal and growing horses.

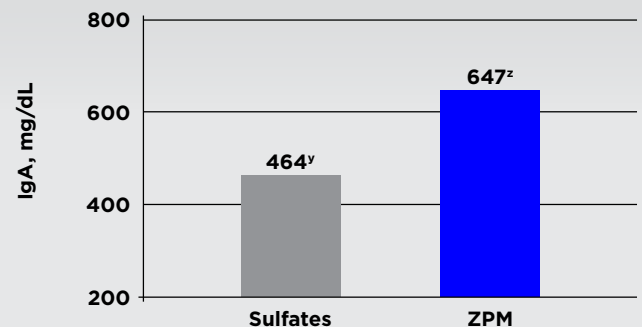
In the first trial, conducted at the University of Florida, broodmares were offered feeds containing the same levels of trace minerals from either Zinpro Performance Minerals or inorganic sulfate sources approximately 84 days prior to their expected foaling date through 112 days post-foaling. At foaling, colostrum samples were collected along with serial blood samples from foals through 36 hours post-foaling.

In a second trial conducted at Colorado State University, yearling horses were offered diets containing similar levels of trace minerals either from Zinpro Performance Minerals or from inorganic sulfate sources. On day 159 of the trial, horses were inoculated against a novel vaccine challenge to determine the effects of mineral source on humoral immunity. Efficiency of digestion was also measured starting on day 90 of dietary treatment to determine the effects of mineral source on enterocyte function.

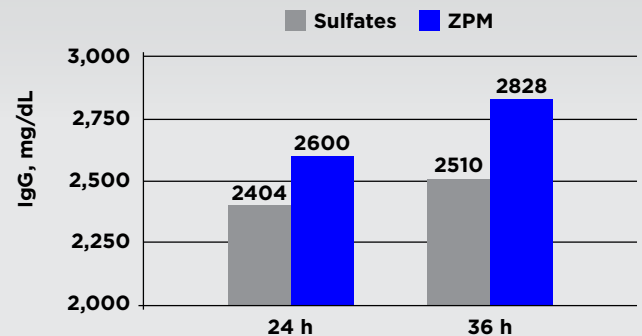
Mare Colostrum IgG



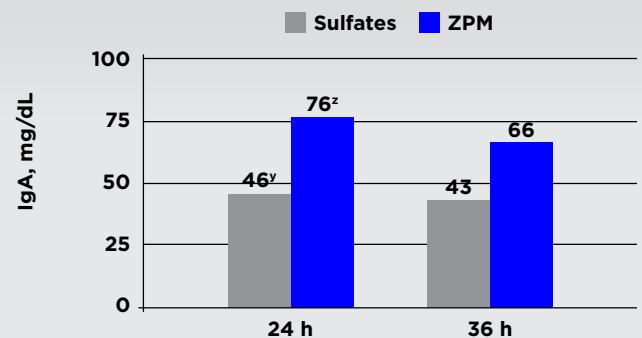
Mare Colostrum IgA



Foal Serum IgG



Foal Serum IgA



YOUNG HORSE (CONTINUED)

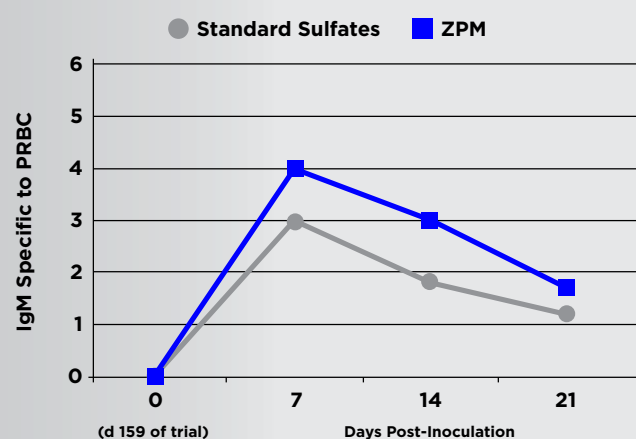
Results from Trial 1 showed:

- ✓ Improved colostrum as measured by immunoglobulin concentration
- ✓ Improved passive transfer of immunity as measured by foal serum immunoglobulin levels

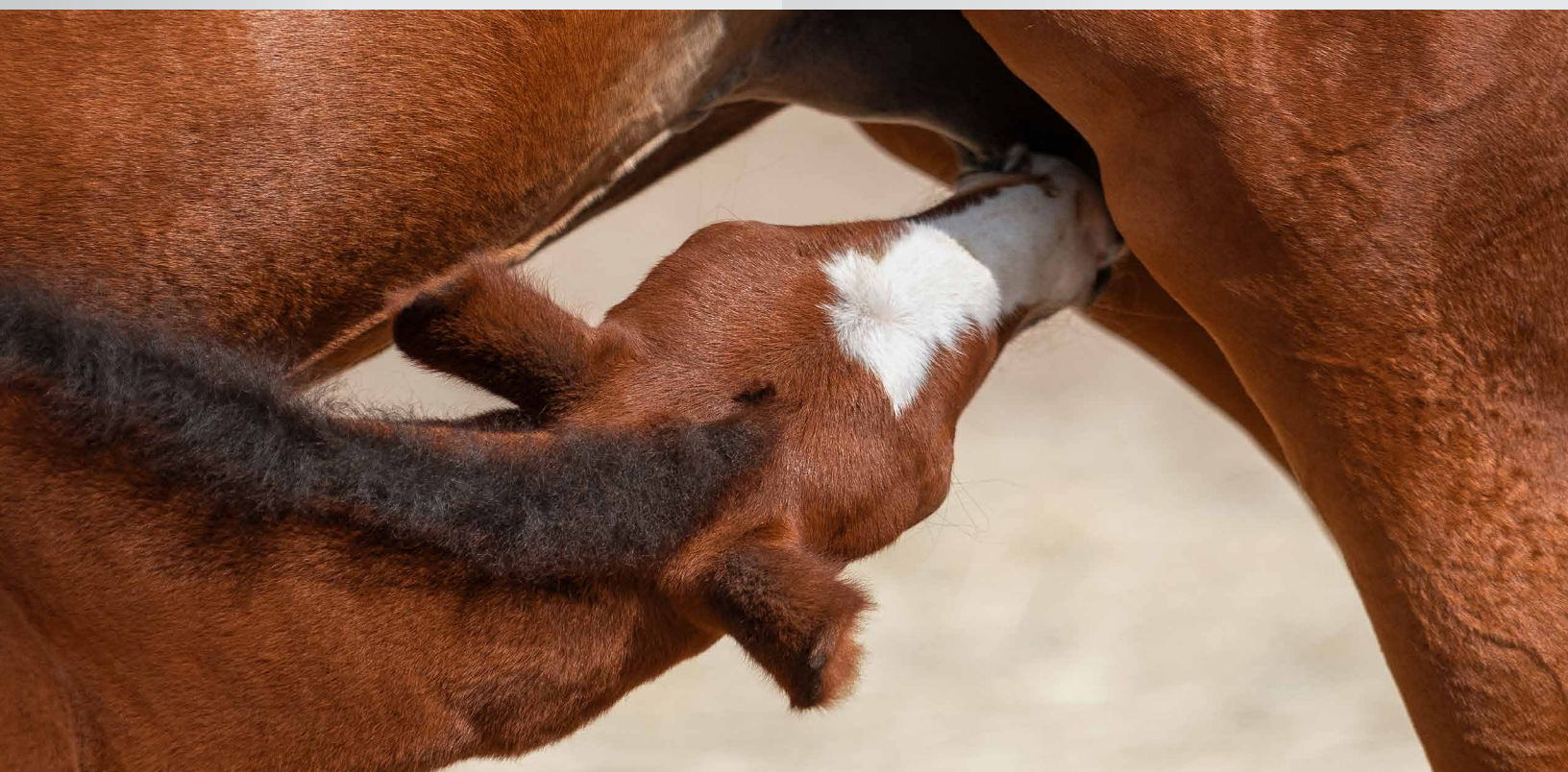
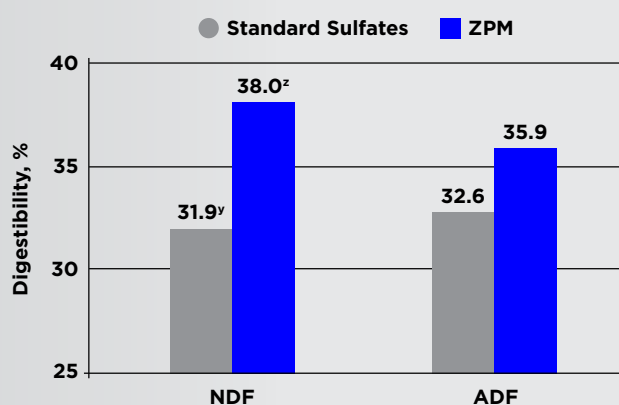
Results from Trial 2 showed:

- ✓ Improved response to a novel vaccine challenge
- ✓ Increased fiber digestibility as measured by neutral detergent fiber (NDF) digestibility

Humoral Immune Response: IgM Antibody Titers in Yearling Horses Challenged with a Novel Vaccine



Apparent Fiber Digestibility in Growing Horses

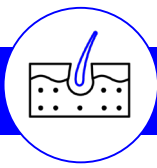




Results from these trials showed:

Neonatal performance is dictated almost entirely by management of the mare prior to and immediately following parturition. Data from Trial 1 demonstrate that when mares are offered their trace minerals as Zinpro Performance Minerals, they are more effective at producing high quality colostrum that in turn is able to significantly improve the passive transfer of immune function to their neonatal offspring. Providing newborn foals with superior immune protection at birth may be directly correlated with improved outcomes from disease challenges. In Trial 1, foals had a 65% increase in circulating serum IgA levels at 24 hours post-foaling. Immunoglobulin A is primarily found at the surface of mucous membranes and is responsible for the prevention of bacterial, viral or toxin infiltration into epithelial cells.

The pre-weaning and post-weaning period represent a significant time of stress for the growing horse. Increased independence and a reduced reliance on mare's milk to meet nutritional needs often result in decreased performance and an increased risk of disease. The data from Trial 2 demonstrate that young horses offered trace minerals as Zinpro Performance Minerals had an improved ability to deal with the stress of dietary transition as demonstrated by an 18.75% increase in NDF digestibility. This equates to an improved ability to utilize the nutrients present in the increasingly important fiber component of the ration. Further, the improved humoral response to vaccination demonstrates that Zinpro Performance Minerals supplementation may improve the foal's ability to deal with immune stressors that can often lead to disease and performance or growth challenges.



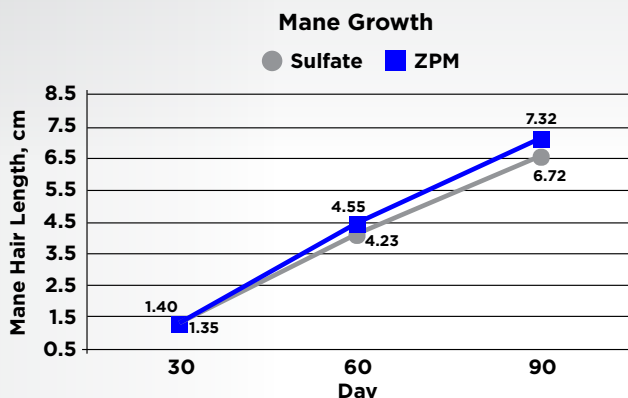
COAT AND HAIR HEALTH

Often times, the first indication to horse owners that something may be wrong with their horses is a decrease in the shine, luster or overall appearance of their horse's coat and skin. The link between nutrition and coat health has been previously investigated and there are specific interventions that are commonly implemented to improve coat health. Zinpro researchers have been interested in this link across species and have found unique responses to trace mineral source on skin and coat health.

In a trial conducted by Zinpro researchers, the effect of trace mineral source was investigated for its role in improving coat appearance and promoting new hair growth. Horses were offered diets containing similar amounts of trace minerals from either Zinpro Performance Mineral sources or inorganic sulfate sources for 90 days. Hair growth measurements and images were collected routinely during the course of the trial.

NUTRITION YOU CAN SEE™

In this trial, mane growth was enhanced in horses offered Zinpro Performance Minerals compared to inorganic sulfate source trace minerals. A numerical 9% increase in mane length was observed at the conclusion of the 90-day trial. Images obtained from horses over the course of the trial demonstrate that Zinpro Performance Mineral incorporated into the diet supported improved overall appearance, shine, luster and enhanced coat color compared to those containing inorganic sulfate-derived trace minerals.

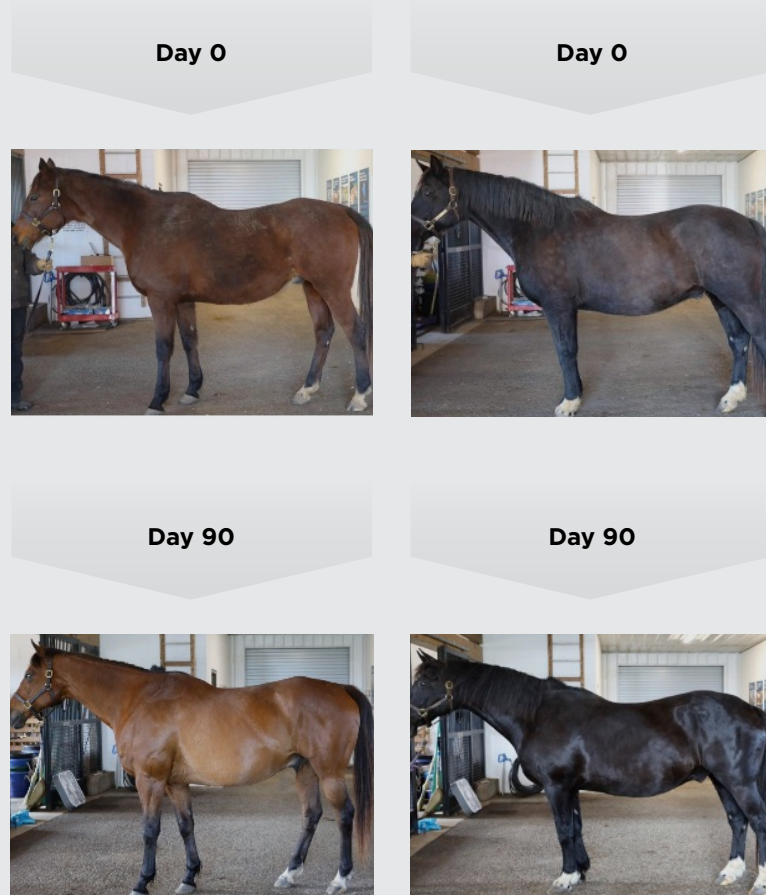


Results from this trial showed:

- ✓ Improved coat quality
- ✓ More rapid mane growth

Appearance of their horses is often second only to performance and health in the perception of horse owners. Improved bioavailability leading to the increased utilization of trace minerals is a foundational aspect supporting the use of Zinpro Performance Minerals in equine rations. The data from this trial demonstrate that equine coat appearance and hair growth are better supported when horses are consuming diets containing Zinpro Performance Minerals compared to traditional inorganic sources.

Hair Coat Transformation



Elevating the Entire Formulation

Zinpro Performance Minerals are designed to meet the trace mineral requirements of horses. However, they are also unique in their ability to improve horse health and performance. As part of a comprehensive formula, Zinpro Performance Minerals can enhance the performance of other ingredients and additives supplied in the feed, supplement or treats.



+ Seaweed-Derived Calcium Buffers

Many equine products contain seaweed-derived calcium buffers designed to support gastric health and performance. Buffering the gastric environment to a pH above 4.0 has been shown to improve gastric health in horses. When formulated together with Zinpro Performance Minerals, the overall benefit to the horse is enhanced as the seaweed-derived calcium buffer increases the pH of the gastric environment and the Zinpro Performance Minerals inclusion supports optimal epithelial integrity function.

+ Omega-3 Fatty Acids

Omega-3 fatty acid sources, such as marine-derived algae, fish oil and flaxseed, are common ingredients in equine feeds and supplements. Their inclusion is driven primarily to increase omega-3 fatty acid concentration in the diet to support a variety of physiologic functions, including joint health, skin and coat quality, reproductive performance and metabolic performance. When combined with Zinpro Performance Minerals, these omega-3 sources may work together to support a more balanced inflammatory response at the cellular level and enhance coat and skin quality.

+ Collagen

While oral joint supplements aimed at chondroprotective mechanisms have not been fully researched in horses, collagen is an ingredient often utilized in equine supplements to support joint health. When combined with Zinpro Performance Minerals, it is possible that the structural support delivered by collagen may be enhanced, providing further support to the equine joint and hoof.

+ Biotin

Biotin is a B-vitamin that is produced predominantly in the hindgut of the horse. In fact, it is assumed that the horse's daily biotin requirement is met by microbial fermentation of feedstuffs. While involved in other biological functions, biotin supports keratin production in hooves, hair and skin. Zinpro Performance Minerals have been shown to improve hoof growth and skin and coat quality, and when combined with biotin in feeds and supplements, the benefits may be further emphasized.

By combining nutritional additives with Zinpro Performance Minerals, feed formulations may realize a 1 + 1 = 10 situation in which the sum of the combined parts is greater than the effects of the individual ingredients on their own.

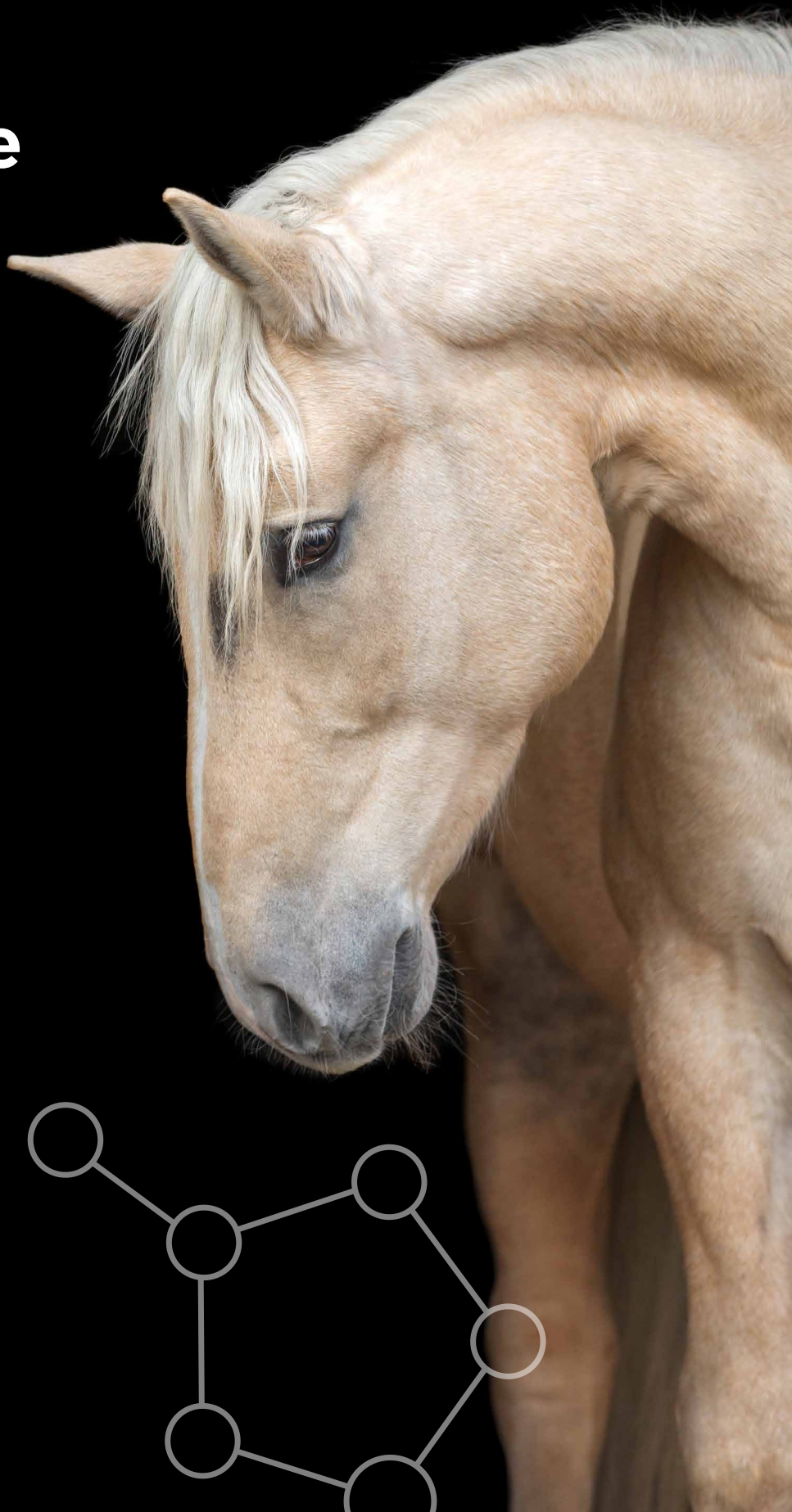
Note: None of these combinations have been specifically researched in horses.

Zinpro Performance Minerals Product Offerings

All Zinpro Performance Minerals can be safely incorporated into equine feeds, supplements and treats.

At Zinpro, we believe that for organic trace minerals to be successfully utilized by the horse, they need to meet 5 essential factors:

- 1** Mineral source must be water soluble
- 2** Mineral source must be stable across a range of physiologic pHs
- 3** Mineral source must be stable in the presence of dietary chelating agents
- 4** Mineral source must be efficiently absorbable from the GI tract
- 5** Mineral source must result in increased or improved animal performance



Zinpro Performance Minerals

Offered in three unique product categories, each with exclusive benefits and characteristics:



- ✓ 1 : 1 mineral : amino acid ratio
- ✓ Methionine utilized as the amino acid ligand



AVAILA®

- ✓ 1 : 1 mineral : amino acid ratio
- ✓ Range of amino acid ligands to take advantage of multiple amino acid transporters



PROPATH®

- ✓ 1 : 1 mineral : amino acid ratio
- ✓ 50% lysine amino acid ligand
- ✓ 50% glutamic acid amino acid ligand



Based on our extensive equine research, as well as the nutritional requirements of horses², our recommendations for daily mineral supplementation are:

Mineral	Daily Supplementation*
Zinc	400 mg
Manganese	400 mg
Copper	100 mg

*These recommendations are for a 500 kg/1,000 lb horse

No matter the feed form, expected consumption rate or other ingredients utilized, Zinpro Performance Minerals fit into equine feed, supplement and treat formulations and are a stable source of highly bioavailable trace minerals.



AVAILA[®] EQUINE

While any of our individual trace mineral offerings or combined products such as Zinpro[®] 4-Plex[®], Zinpro[®] Availa[®] 4 or Zinpro[®] ProPath[®] 4 can be safely and effectively fed to horses, Zinpro also has a unique offering designed specifically for the equine market.

Zinpro[®] Availa[®] Equine is designed to meet the unique needs of equine formulas providing easy formulation and concentrations formulated specifically to meet the nutritional requirements of the horse. At only 10 g per day, Zinpro[®] Availa[®] Equine will provide 100% of the recommended levels of zinc, manganese and copper. It contains no added iron or cobalt and is safe and effective for horses of all ages, breeds, performance levels or reproductive status.

- ✓ **Formulation ease: 10 g per day**
- ✓ **Research-proven benefits**
- ✓ **Equine specific marketing and branding**
- ✓ **No added iron or cobalt**
- ✓ **Safe and effective for horses**



That's the Zinpro Effect



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