



Minerals & Performance : *Total Performance, Total Performance Plus*

June Educational Webinar 2018
Dr Tania Cubitt
Performance Horse Nutrition



IRON



- Heme – oxygen carrying capacity
- Iron deficiency rare
- Iron is efficiently absorbed at low levels of intake
- Iron absorption is decreased as iron intake increases
- Research has failed to show an increase in hemoglobin, packed cell volume or serum iron when ponies were fed high levels of iron
- Iron oxide poorly absorbed
- Lost in sweat



MANGANESE



- Bone formation
- Formation of Chondroitin Sulfate
- Deficiency in growing horses poor growth plate development
- Energy metabolism
- Protein metabolism
- Fat metabolism
- Little Mn in sweat



SELENIUM



- Antioxidant
 - Exercise takes oxygen to tissues, oxidises energy substrates – creates reactive oxygen byproducts – selenium as an “antioxidant” removes this waste
- Immune function
- Thyroid function
- Reproductive function



IODINE



- Thyroid hormone synthesis
- Muscle
- Nervous system
- Respiratory system
- Cardiovascular system
- Signs of an iodine imbalance include poor coat and hair loss, lethargy, low body temperature, and increased susceptibility to infectious diseases. Iodine-deficient mares also tend to give birth to stillborn or weak foals



ZINC



- Protein metabolism
- Carbohydrate metabolism
- Bone development
- Skin and hoof
- Zinc deficiency can cause low insulin levels and reduced glucose tolerance



COPPER



- Connective tissue
- Metabolism of iron
- Energy production
- melanin



CALCIUM



- Relationship with Phosphorus
- Bone metabolism
- Muscle function
- Nerve function



PHOSPHORUS



- Bone metabolism
- Energy metabolism
- Phosphorus also helps form the backbone of DNA and contributes to the pH and electrolyte balance in body fluids.



MAGNESIUM



- Muscle contraction
- Nerve impulses
- Energy metabolism
- Skeletal system



VITAMIN E



- Fat soluble
- Anti oxidant
- Cell membrane
- Immune function
- Muscle function
- Vitamin E (alpha-tocopherol) is abundant in lush, green pastures particularly in alfalfa and diminishes with maturation.
- Decreased vitamin E status is implicated in the etiology of exercise-induced muscle damage in horses



VITAMIN E



- Natural vitamin E is better utilized than synthetic.

Horse Class	Forage Source	Supplemental Vitamin E (IU/day)
Foals and yearlings	Stored roughages Lush grass	500-1,000 Not needed
Working horses	Stored roughages Lush grass	2,000-4,000 500-1,000
Pregnant and Lactating mares	Stored roughages Lush grass	2,000-4,000 500-1,000
Stallions	Stored roughages Lush grass	1,000-2,000 Not needed



BIOTIN



- Biotin occurs naturally in many feedstuffs commonly fed to horses such as oats, soybean meal, alfalfa, rice bran, and molasses. However, horses derive most of their biotin requirement from the fermentation of forages by the microbial population in the hindgut.
- nutrients such as zinc, methionine, and iodine can also affect hoof quality



VITAMIN B₇ - BIOTIN



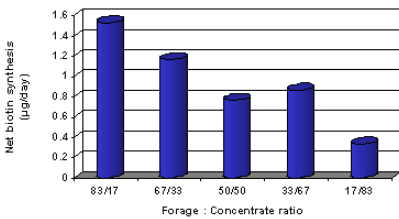
- Needed for energy metabolism as well as fatty acid and amino acid synthesis
- Important for gluconeogenesis
- Deficiency has been implicated with poor hoof quality and growth.
- Synthesized by microbes in the hindgut
- Water soluble



BIOTIN



Synthesis of Biotin - an *in vitro* study





(Da Costa Gomez et al., 1998)



COBALT



- Cobalt is a trace mineral found in B vitamins that horses require in tiny amounts for correct functioning of their physiology. As a result, all horses will have trace amounts of the substance in their systems.
- Cobalt stabilizes a protein called "hypoxia-inducible transcription factors," abbreviated HIF, that help stimulate the gene for erythropoietin (EPO). In turn, increased EPO levels stimulate red blood cell production.
- High levels of dietary cobalt could actually cause cardiovascular compromise of heart failure, nausea, nerve and thyroid dysfunction, and contribute to an increased risk of cancer, as seen in humans.



VITAMIN A



- Antioxidant
- Vision
- Reproduction
- Immune function
- Fat Soluble
- Vitamin A is synthesized in the horse's intestine from beta-carotene, grazing horses are usually well supplied. Freshly cut hay also contains some vitamin A, but the level declines quickly after the hay is baled.
- pregnant broodmares have an increased vitamin A requirement



VITAMIN D



- Vitamin D is actually a hormone, and adequate sunlight results in the production of sufficient vitamin D from 7-dehydrocholesterol in the skin.
- vitamin D must be present for calcium and phosphorus to be absorbed
- Restricting the amount of turnout for horses to less than two hours a day prevents their bodies from having time to convert sufficient vitamin D in the skin.
- Fat soluble



VITAMIN K



- Blood Clotting
- Bone metabolism
- Fat soluble
- Conditions that interfere with vitamin K function are impaired fat absorption, gastric ulcers, mycotoxins in the feed, long-term antibiotic treatment
- vitamin K deficiency in horses due to inadequate consumption has not been described



LABELS




Equine feed (all classes):


- (See page 33)
- (a) A minimum guarantee for crude protein
 - (b) A minimum guarantee for crude fat
 - (c) A maximum guarantee for crude fiber
 - (d) A minimum and maximum guarantee for calcium
 - (e) A minimum guarantee for phosphorus
 - (f) A minimum guarantee for copper, stated in parts per million (ppm)
 - (g) A minimum guarantee for selenium, stated in parts per million (ppm)
 - (h) A minimum guarantee for zinc, stated in parts per million (ppm)
 - (i) A minimum guarantee for Vitamin A, other than the precursors of Vitamin A, if added

Equine feed - Mineral supplements (all classes):

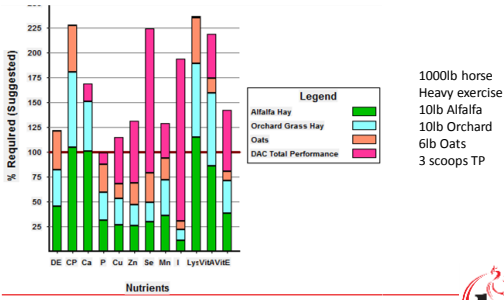
- (See page 34)
- (a) A minimum and maximum guarantee for calcium
 - (b) A minimum guarantee for phosphorus
 - (c) A minimum and maximum guarantee for salt
 - (d) A minimum and maximum guarantee for total sodium, if total sodium exceeds that furnished by the maximum salt guarantee
 - (e) A minimum level of copper, stated in parts per million (ppm)
 - (f) A minimum guarantee for selenium, stated in parts per million (ppm)
 - (g) A minimum guarantee for zinc, stated in parts per million (ppm)
 - (h) A minimum guarantee for Vitamin A, other than the precursors of Vitamin A, if added



Brand Name	YOUR NAME FEEDS																						
Product Name	Tennessee Jet's Horse Feed																						
Purpose Statement & (medicated claim if required)	 For maintenance of horses																						
Drug Guarantee																							
Guaranteed Analysis	<table border="1"> <tr><th colspan="2">Guaranteed Analysis</th></tr> <tr><td>Crude Protein, minimum</td><td>12.0%</td></tr> <tr><td>Crude Fat, minimum</td><td>3.0%</td></tr> <tr><td>Crude Fiber, maximum</td><td>12.0%</td></tr> <tr><td>Calcium, minimum</td><td>0.8%</td></tr> <tr><td>Calcium, maximum</td><td>1.3%</td></tr> <tr><td>Phosphorus, minimum</td><td>0.65%</td></tr> <tr><td>Copper, minimum</td><td>30 ppm</td></tr> <tr><td>Selenium, minimum</td><td>0.30 ppm</td></tr> <tr><td>Zinc, minimum</td><td>40 ppm</td></tr> <tr><td>Vitamin A, minimum</td><td>7000 I.U./lb</td></tr> </table>	Guaranteed Analysis		Crude Protein, minimum	12.0%	Crude Fat, minimum	3.0%	Crude Fiber, maximum	12.0%	Calcium, minimum	0.8%	Calcium, maximum	1.3%	Phosphorus, minimum	0.65%	Copper, minimum	30 ppm	Selenium, minimum	0.30 ppm	Zinc, minimum	40 ppm	Vitamin A, minimum	7000 I.U./lb
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Vitamin A, minimum	7000 I.U./lb																						
Ingredient Statement	<p>Ingredient Statement</p> <p>Grain Products, Plant Products, Processed Grain By Products, Molasses Products, Calcium Lignin Sulfonate, Vitamin A Supplement, D-Activated Animal Sterol (source of Vitamin D₃), Riboflavin Supplement, Chlorine Chloride, Biotin, Thiamine Mononitrate, Pyridoxine Hydrochloride, Vitamin E Supplement, Folic Acid, Ground Limestone, Dicalcium Phosphate, Copper Sulfate, Manganese Oxide, Magnesium Oxide, Zinc Oxide, Ferrous Sulfate, Cobalt Carbonate, Calcium Carbonate, Salt, Preservative Chloride.</p>																						
Use Directions	<p>FEEDING DIRECTIONS</p> <p>Feed 1/2 to 1 lb. of feed per 100 lb. of body weight per day for the maintenance of horses.</p>																						
Precautionary Statement (if required)																							
Responsible Party's Name & Address	YOUR NAME FEEDS City, State Zip																						
Quantity Statement	NET WT 50 LB (22.67 kg)																						

Brand Name	YOUR NAME FEEDS																				
Product Name	Tennessee Jet's Pasture Horse Mineral																				
Purpose Statement & (medicated claim if required)	 For maintenance of horses																				
Drug Guarantee																					
Guaranteed Analysis	<table border="1"> <tr><th colspan="2">Guaranteed Analysis</th></tr> <tr><td>Calcium, minimum</td><td>12.0%</td></tr> <tr><td>Calcium, maximum</td><td>14.0%</td></tr> <tr><td>Phosphorus, minimum</td><td>12.0%</td></tr> <tr><td>Salt, minimum</td><td>4.5%</td></tr> <tr><td>Salt, maximum</td><td>5.5%</td></tr> <tr><td>Copper, minimum</td><td>860.0 ppm</td></tr> <tr><td>Selenium, minimum</td><td>0.30 ppm</td></tr> <tr><td>Zinc, minimum</td><td>3400.0 ppm</td></tr> <tr><td>Vitamin A, minimum</td><td>80,000 I.U./lb</td></tr> </table>	Guaranteed Analysis		Calcium, minimum	12.0%	Calcium, maximum	14.0%	Phosphorus, minimum	12.0%	Salt, minimum	4.5%	Salt, maximum	5.5%	Copper, minimum	860.0 ppm	Selenium, minimum	0.30 ppm	Zinc, minimum	3400.0 ppm	Vitamin A, minimum	80,000 I.U./lb
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Zinc, minimum	3400.0 ppm																				
Vitamin A, minimum	80,000 I.U./lb																				
Ingredient Statement	<p>Ingredient Statement</p> <p>Calcium Carbonate, Dicalcium Phosphate, Salt, Copper Sulfate, Manganese Oxide, Molasses Products, Zinc Oxide, Ferrous Sulfate, Cobalt Carbonate, Calcium Iodate, Vitamin A Supplement, Processed Grain By Products, Chlorine Chloride, Animal Fat, Ethoxyquin (a preservative), Sodium Selenate.</p>																				
Use Directions	<p>FEEDING DIRECTIONS</p> <p>Feed free-choice at an appropriate rate of 2 scoops/day. Provide fresh water and white salt free-choice.</p>																				
Precautionary Statement (if required)																					
Responsible Party's Name & Address	YOUR NAME FEEDS City, State Zip																				
Quantity Statement	NET WT 50 LB (22.67 kg)																				

DIET



TOTAL PERFORMANCE PLUS



	Total Performance Plus 3 oz	Optimum Flex 1 oz
MSM	8,400 mg	8,500 mg
Glucosamine	3,960 mg	4,000 mg
Chondroitin	990 mg	1,000 mg
Hyaluronic Acid	150 mg	150 mg