Nutritional Content of Five Equine Nutritional Supplements Relative to a 500 Kg Working Horse

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American Association of Equine Practitioners

Equine Nutritional Supplements

Widespread in equine industry

Driven by Direct-to-Consumer advertising

Equine practitioners may be asked for advice on "best" supplement

How Widespread?

- Specific data on equine supplement industry is <u>not</u> available
- In 2006, the Human Supplement Industry produced:
 - \$22.5 Billion in Direct Sales
 - \$38.0 Billion in Indirect and Induced Revenues
- In 2009, estimates are more than \$28 Billion





"... addresses equine health at the cellular level, providing a special blend of more than 55 natural ingredients that support the fundamental health of each of your horse's 12 trillion cells"

"You won't find a product that offers a more comprehensive range of the most important nutrients"



"... reflects decades of research, development and use by the top trainers in the country"



"...contains virtually every beneficial nutritional ingredient an equine supplement can provide to improve a horse's condition and performance."





"... comprehensive multi-vitamin and mineral supplement: an exclusive blend of balanced nutrients like no other."

The Problem

Equine practitioners may be asked for advice on the "best" supplement



There is no obvious criteria for what might constitute "best," or if any of them are needed at all



Analysis

 It is possible to calculate the levels of nutrients provided in:

- A typical diet
- An equine supplement product relative to a horse's daily needs



Assumptions

- Used a 500 kg horse in light work for dietary formulation
- Used NRC values for nutritional requirements
- Assumed that the label content of the products were accurate
 - Not necessarily true
 - No regulatory oversight
 - Numerous studies in human medicine, as well as a few in horses, have shown that supplements may not contain label levels of ingredients (e.g., glucosamine and chondroitin sulfate supplements)



Step 1: What Does the Normal Horse's Diet Provide?



"Gosh, so you really DO eat like a horse!"



NATIONAL RESEARCH COUNCE

NRC, 6th edition, 2007

Step 1: What Does the Horse NEED?



Computer Program: http://www.agmodels.com/Demos/NRC_Equine89/Equine_Model_2006.asp

THE NATIONAL ACADEMIES Advises to the Nation or Science, Engineering, and Medicine

2007 Nutrient Requirements of Horses

		Animal	Specification	on					
500 Mature W	leight, kg	500 Est	imated Act	tual Weig	ght, kg				
2.00 % - Intake	Level, % BW	1							
Adult at Mainter	nance								
Stallion									
Growing									
0									
Pregnant									
C Lactating									
Working/Trainin	ligh	t - V	Vork Load						
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Working/Trainin	ng Ligh	it v V	CP		Ca	P	Na	CI	K
Working/Trainin	ng Ligh Am kg	nt v V	CP 9 699	Lys g 30	Ca 9 30	P g 18	Na 9 13.9	CI 9 46,6	K 9 28
Working/Trainin Working/Trainin	Am kg	t DE Mical 19.98 .00 0.001	CP 9 699 0	Lys g 30	Ca 9 30	P g 18 0	Na 9 13.9 0.0	CI 9 46.6 0.0	<u>к</u> g 28
Working/Trainin Working/Trainin	Am kg ts 0. -10.	nt DE Mical 19.98 00 0.00 00 -19.98	CP 9 699 0 -699	Lys 9 30 0 -30	Ca 9 30 -30	P g 18 0 -18	Na 9 13.9 0.0 -14	CI 9 46.6 0.0 -47	K 9 28 0 -28
Working/Trainin Working/Trainin Netary Supply Balance Densities (per kg Di	Am kg ts 0. -10.	nt DE Mical 19.98 .00 0.00 .00 -19.98	CP 9 699 0 -699	Lys 9 30 0 -30	Ca 9 30 -30	P g 18 0 -18	Na 9 13.9 0.0 -14	CI 9 46.6 0.0 -47	K 9 28 0 -28

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2007 Nutrient Requirements of Horses

Title Page	Animal Specification	Dietary Supply	Nut	ther rients	Prog	ram fo	Progr Opera	am tion	
	Da	ily Requireme	nts for Oth	er Nutrie	nts				
	Magnesium Sulfur (S) Cobalt (Co) Copper (Cu Iodine (I) Iron (Fe) Manganese Zinc (Zn) Selenium (S Vitamin A Vitamin D Vitamin E Thiamin Riboflavin	(Mg)) (Mn) ;e)	9.50 15.0 0.5 100.0 3.5 400.0 400.0 1.00 22500 3300 800 30.0 20.0	g g mg mg mg mg U U U U mg mg					
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		10.09	699	30	30	18	13.9	16.6	21
Animal Requiremen	its	4.91.949					_		_
Animal Requiremen	its	0.00 0.00	0	0	0	0	0.0	0.0	
Animal Requiremen Dietary Supply Balance	-1	0.00 0.00	-699	0 -30	-30	-18	-14	-47	-21

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Step 2: What Does the Horse's Diet Provide?



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LEGUME HAY Accumulated crop years: 05/01/2000 through 04/30/2011

Item	Samples	Average	Norm	nal Range	St. Dev
% Dry Matter	150,142	90.896	89.526	92.265	1.370
% Crude Protein	147,933	21.278	18.598	23.958	2.680
% Lignin	103,189	7.194	6.176	8.213	1.018
% Acid Detergent Fiber	147,103	30.381	26.499	34.263	3.882
% Neutral Detergent Fiber	147,196	38.708	33.505	43.910	5.203
% Crude Fiber	725	25.521	20.097	30.945	5.424
% WSC (Water Sol. Carbs.)	88,533	9.181	7.349	11.013	1.832
% ESC (Simple Sugars)	47,840	7.441	5.929	8.954	1.512
% Starch	92,362	1.849	0.876	2.821	0.973
% Non Structural Carbo. (NSC)	39,412	11.004	8.757	13.250	2.246
% Non Fiber Carbo. (NFC)	128,203	30.783	27.294	34.272	3.489
% Crude Fat	99,502	2.422	2.009	2.835	0.413
% Ash	100,270	10.563	9.120	12.006	1.443
Relative Feed Value (RFV)	147,067	160.317	132.923	187.711	27.394
% Calcium	131,954	1.530	0.000	4.537	3.007
% Phosphorus	131,959	0.274	0.224	0.324	0.050
% Magnesium	130,448	0.309	0.240	0.377	0.068
% Potassium	130,862	2.368	1.846	2.891	0.523
% Sodium	38,146	0.143	0.019	0.267	0.124
PPM Iron	36,598	375.724	16.153	735.295	359.571
PPM Zinc	36,580	27.979	0.000	1025.048	997.070
PPM Copper	36,600	8.978	3.737	14.218	5.240
PPM Manganese	36,576	36.537	19.987	53.087	16.550
PPM Molybdenum	36,698	1.922	0.306	3.539	1.617
PPM Cobalt	259	0.464	0.000	0.997	0.533
% Sulfur	103,823	0.271	0.179	0.363	0.092
% Chloride	74,015	0.730	0.402	1.059	0.328
% Nitrate	4,696	0.074	0.000	0.186	0.112
% Nitrates	8,754	0.185	0.008	0.362	0.177
PPM Nitrate-Nitrogen	8,754	417.666	17.148	818.184	400.518
Horse DE, Mcal/Lb.	108,791	1.193	1.062	1.324	0.131
x					

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What Does the Horse's Diet Provide?

Provide Adequate Calories

LEGUME HAY BASED



7.03 kg

GRASS HAY BASED



9.10 kg

Added 0.45 kg (1 pound) of OATS

- Adds energy
- Carrier for supplement



What Does the Horse's Diet Provide?

- Both diets are, in general, more than adequate to satisfy the nutritional needs of a 500 kg, mature horse in light work
 - May be lacking NaCl
 - Possibly Selenium deficient, depending on area



Step 3: What's in the Supplement?

Compared labeled amount of ingredient to needs of 500 kg horse in light work

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Tale Anima Face Specifics	ten	Dietary Supply	1	other	b	ooram Infa	00	eraten	
	Daily Re	quirense	ats for O	ther Nul	rients				
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	And	DF 1	10	i va	0	P	-	0	
	kg	Moal	9	9	9	0	9	9	
Animal Requirements		19.98	699	30	39	10	13.9	46.6	28.5
Distary Supply	0.00	0.00	0	Ó	0	. 0	0.0	0.0	0.0
Balance	-18.00	-10.08	-699	-30	-38	- 18	-14	-47	-28.3
Densities (per kg DH)		3.00	7.0	0.30	0.30	0.18	0.14	0.47	0.11

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Serving Size: 1oz. (29.5ml) Servings per Amount per % Daily 32 Container: Serving Value Calories 0 -Total Carbohydrates 0% 0g Sugars 0g . VITAMIN A (BETA CAROTENE) 1000 iu VITAMIN D3 (CHOLECALCIFEROL) 5000 iu VITAMIN C (ESTER C[®]) 500ma 555% VITAMIN E (D-ALPHA TOCOPHEROL) 300 iu 2000% 25 mg VITAMIN B1 (THIAMINE) VITAMIN B2 (RIBOFLAVIN) 25 mg 1920% VITAMIN B3 (NIACINAMIDE) 156% 25 mg 500% VITAMIN B5 (PANTOTHENIC ACID) 25 mg VITAMIN B6 (PYRIDOXINE) 25 mg 1923% VITAMIN B12 (MethylCOBALAMIN) 500 mcg 8333% FOLIC ACID (FOLATE) 400 mca 100% BIOTIN 600 mcg QUERCETIN 3 mg . 5% CALCIUM (LACTATE/GLUCONATE) 50 mg MAGNESIUM (CITRATE) 25 mg 6% ZINC (GLUCONATE) 272% 25 mg SELENIUM (CHELATE) 100 mcg 143% COPPER (GLUCONATE) 2 mg POTASSIUM (POTASSIUM GLUCONATE) 250 mg 5.3% CHROMIUM (POLYNICOTINATE) 200 mcg 5.71% VANADIUM (SULFATE) 70 PLANT SOURCE IONIC MINERALS SPECIALTY INGREDIENTS RESVERATROL 100 mg OPC GRAPE SEED EXTRACT 60 mg COENZYME Q10 100 mg (OMEGA 3 FROM PERILLA OIL 4:1) 1000 mg AMINO ACIDS L-ARGININE 5000 mg . L-CITRULLINE 200 mg OTHER INGREDIENTS: PURIFIED WATER, CITRIC ACID, XANTHAN GUM, NATURAL FLAVORS, TART CHERRY, RASPBERRY, LEMON-LIME, COCONUT, PINEAPPLE, ORANGE-PAPAYA, VANILLA, POTASSIUM BENZOATE AND POTASSIUM SORBATE AS

SUPPLEMENT FACTS

PRESERVATIVES.

* DALY VALUE NOT ESTABLISHED FOR THIS NUTRIENT * Percent Delly Values are based on a 2,000 calorie det. Your dely values may be higher or lower depending on your calorie needs

rapie i. Nutrent outent of ouppendents	Table 1.	Nutrient	Content of	of Supple	ements
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ING	NRC	PP	%NRC	D	%NRC	GV	%NRC	VP	%NRC	VFA	%NRC
Lysin	30 g	1122 mg	3.74	540 mg	1.8	1500 mg	5.0	283 mg	0.94	55.90 mg	0.18
Ca	30 g	396 mg	1.32	2.83 g	9.4	2495 mg	8.31	1560 mg	5.2	680.4 mg	2.26
P	18 g	1060 mg	5.89	1.98 g	11	990 mg	5.5	850 mg	4.7	425.26 mg	2.36
Na	13.9 g	130 mg	0.93	249 mg	1.8	Not listed	?	?	?	?	?
CI	46.6 g	250 mg	0.54	N/A	?	Not listed	2	2	2	2	2
K	28.5 g	1320 mg	4.6	540 mg	1.9	1245 mg	4.37	482 mg	1.69	198.46 mg	0.69
Mg	9.5 g	540 mg	5.6	425 mg	4.47	850 mg	8.94	25 mg	0.26	283.5 mg	2.98
S	15 g	475.2 mg	3.1	522 mg	3.48	227 mg	1.51	?	7	340 mg	2.26
Co	0.5 mg	792 µg	158.4	2.84 mg	568.0	1 mg	200	0.1 mg	20.0	1.24 mg	248.0
Cu	100 mg	13.2 mg	13.2	16.25 mg	16.25	75 mg	75.0	8 mg	8.0	22 mg	22.0
1	3.5 mg	660 µg	18.85	6.25 mg	178.57	1 mg	35.0	2 mg	57.14	2 mg	57.0
Fe	400 mg	264 mg	66.00	437.5 mg	109.37	250 mg	62.5	200 mg	50.0	212 mg	53.0
Mn	400 mg	132 mg	33.0	61.36 mg	15.34	148 mg	37.0	20 mg	50.0	283.5 mg	70.87
Zn	400 mg	132 mg	33.0	137 mg	34.25	200 mg	50.0	40 mg	10.0	72 mg	18.0
Se	1 mg	0.79 mg	79.0	2.27 mg	227.0	1 mg	100.0	20 µg	2.0	0.8 mg	80.0
Vit A	22,500 IU	7500 IU	33.33	59,375 IU	263.88	22,500 IU	100.0	50,000 IU	222.22	12,500 IU	55.55
Vit D	3300 IU	1500 IU	45.45	9375 IU	284.09	32,660 IU	989.69	5000 IU	151.51	2500 IU	75.75
Vit E	800 IU	740 IU	92.5	86.87 IU	10.85	500 IU	62.5	50 IU	6.25	500 IU	62.5
Thiam B1	30 mg	Not listed	?	13.75 mg	45.83	2150 µg	7.1	?	?	28.12 mg	93.73
Ribo B2	20 mg	15.4	77.0	175 mg	875.00	50 mg	250.0	?	?	11.88 mg	59.40

ING, ingredient; NRC, absolute requirements (500-kg horse at light work); %NRC, percent of NRC values supplied by supplement; PP, Platinum Performance; D, Dynamite; GV, Grand Meadows Grand-Vite; VP, Farnum Vita-Plus; VFA, Vita-Flex Accel.





% of N	leeds
Lysine	5.0%
Cu	75%
Со	200%















Results



- Depending on the nutrient, and the supplement, levels varied from 0.18% to 875% of the horse's daily nutritional requirement
- Levels of individual nutrients analyzed in each individual supplement are both far below and far above the horse's daily nutritional requirement
- None of the supplement products appear to be formulated with any particular nutritional goals in mind, or "balanced" at any level for any particular nutrient

Human Supplement Research

- A succession of large-scale human studies, including two published in October of 2011, suggests that multivitamins and many other dietary supplements:
 - Often do not have health benefits
 - In some cases may even cause harm



- Vitamin E and the risk of prostate cancer: the Selenium and Vitamin E Cancer Prevention Trial. Klein EA, et al. JAMA. 2011;306(14):1549-56.
- Dietary Supplements and Mortality Rate in Older Women: The Iowa Women's Health Study. Mursu J, et al. Arch Intern Med. 2011; 171(18):1625-33.

Human Supplement Research

The data have prompted some nutrition researchers to say taking vitamins is a waste of money for those without a specific nutrient deficiency or chronic illness

Wall Street Journal, October 26, 2011

"The case for dietary supplements is collapsing"

"The better the quality of the research, the less benefit [supplements] showed, It's fair to say from the research that supplements don't make healthy people healthier."

Marion Nestle

Professor of Nutrition, Food Studies, and Public Health New York University



Does Science Matter?

"The thing you do with [reports of studies] is just ride them out, and literally we see no impact on our business," said Joseph Fortunato, chief executive of supplement retailer GNC Corp., according to a transcript of the company's third-quarter conference call with analysts last week.

"Consumers believe in our products," a spokesman for GNC said. GNC's revenue grew 15.5% in the third quarter of this year compared to a year ago and the stock, which closed at \$25.08, is up 0.5% year-to-date.

WSJ, October 26, 2011



Conclusions

- 1. Most horse diets would appear to adequately fulfill the horse's nutritional needs, assuming that the diet provides adequate calories
- 2. As such, there is, in general, no reason to provide supplemental nutrients in the absence of specific deficiencies
- 3. In general, the supplements analyzed in this study do not provide significant amounts of required nutrients, with individual exceptions, e.g., cobalt or Vitamin A
- 4. In general, if a horse's diet is deficient in a particular nutrient, the supplements analyzed provide insufficient amounts to correct the deficiency
- 5. If amounts of nutrients in a product are insufficient to correct potential dietary deficiencies, there should be no obvious reason to give them
- 6. Equine Practitioners can use the methods presented here to analyze individual supplements, and provide appropriate recommendations to their clients

