Reading Labels Part 1 – Understanding Supplements

Are You Comparing Apples to Apples?

(After working on this for more than an hour and barely scratching the surface, I suddenly realized that this will end up a very long (and boring) blog entry, indeed, so maybe I'll try to do this in a series of smaller bite-sized chunks. For now, I'm going to start with supplements. I think they will be easier to sort out. If you want to know more about feeds, keep checking back. I'll eventually finish this…I hope.)

With the tremendous range of feeds and supplements available, how do you even begin to select the right ones for the horses in your stable?

Do you mostly rely on testimonials from friends, feed merchants, or sales reps from the feed/supplement companies themselves? If so, you are not alone. The most common questions I am asked, by the horsemen I meet, from all around the world, relate to comparing feeds or feed supplements. I get a lot of, "hey doc, a rep from a supplement/feed company came the other day and told me about one of their products. They said it was the best ever… but they *all* say that. What do you think of it? Should I feed it to my horses?"

If you have ever wanted to ask those questions, read on. I'll try to give you some tools to sort out the wheat from the chaff. Just like the horsemen who ask me about new products they have come across, I can't always answer those questions immediately. I have to follow a process to objectively evaluate them. I'll get to that next.

To begin with, so you feel better about your state of confusion when looking at supplements, here is my experience with the same thing. *(…and keep in mind, I am a veterinarian, and I studied nutrition in university before starting veterinary school.)*

Back in 1999-2000 or so, I started looking at oral pastes and powders as a practical, economical alternative to the more invasive and expensive pre-race treatments I used to give my patients.

> *(My "loaded amino acid jug" was a Duphalyte or Amino Plus with 30cc's CaCo Copper, 10cc's Hemo 15, and 10cc Hippiron, with or without vitamin B12 and vitamin C, given iv along with folic acid given im. Some of my clients liked to have their horses tubed with electrolytes and given Co-Forta injections instead).*

In order to find one, or a couple of pastes in combination, that I could recommend to my clients, I looked at *lots* of supplements…practically all that were available in 2000, in fact.
I found a huge number of products listing different combinations of nutrients that were

1. included in different forms *(For example, Calcium could be provided as Calcium carbonate, Tri-calcium phosphate, or Calcium gluconate)*, and
2. quantified with different units of measure *(mg/kg, %, ppm, to name only a few)*.
3. Then, they were to be given in different doses.

The most confusing paste I found listed contents in terms of parts per million (ppm), percentages, and mg/kg. Then, the syringe was in pounds and the recommended dose in ounces. OMG!!! Clear as mud!!! What I was beginning to wonder, was that if some companies don't actually *want* you to know how much or little of each nutrient is in their product. Standing in the feed store, it was nearly impossible to do all of the mental gymnastics required to evaluate and compare the products available. So, I did what you must do if you want to fairly compare apples to apples rather than apples to oranges.

1. I made a list of label information and recommended feeding rates.

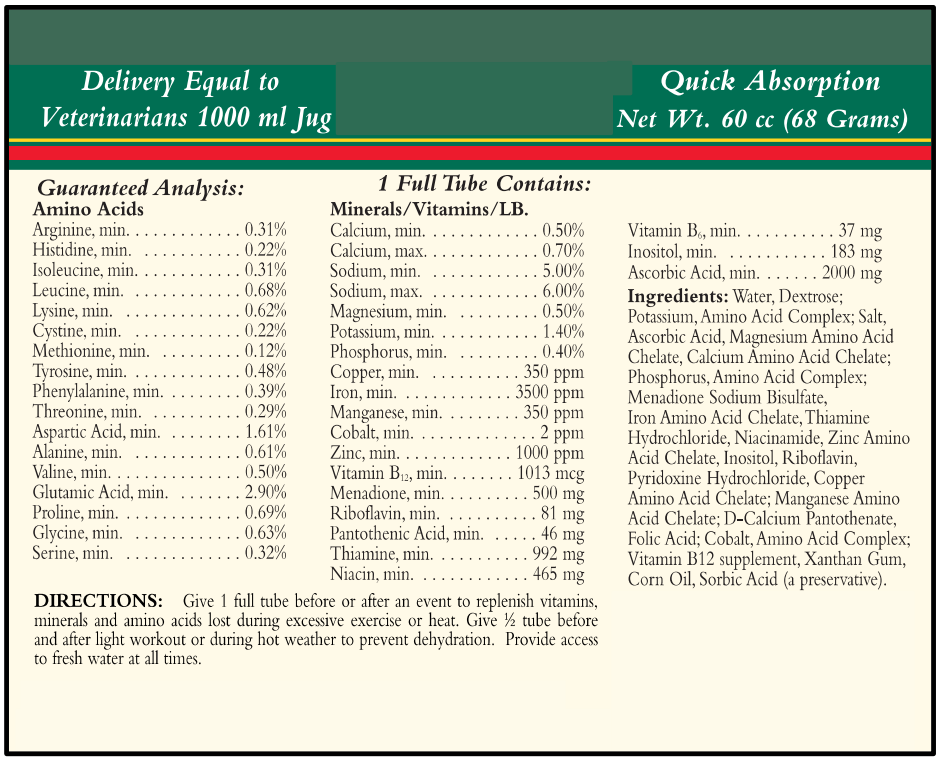
   Then, before I could really compare supplements, I had to go home with my lists of label information, sit down with a calculator or spread sheet *(…and a wine…or a latte…)*, look up conversion factors, and look up nutrient requirements.

   Here is my basic spread sheet that you are welcome to copy rather than typing all the nutrients into your own.

(*If you just fill in the quantities and units as well as the dosage found on the label, the spread sheet should calculate the contents per dose for you. If you come across units not covered in my spread sheet, please read on and try and understand how to convert units yourself. If the math is just too off-putting for you, contact us at Pro-Dosa, and we will be happy to do the conversions for you and add them to my spread sheet for everyone else's benefit.)*

2. Enter or write down the contents as listed on the label, including the units.

   Are the quantities listed in micrograms (mcg or ug), milligrams (mg), grams (g), kilograms (kg), parts per million (ppm), percentages (%), international units (iu), or 1000-international units (kiu or IU)? Are those quantities listed per kg, pound, or dose of the product in question?



Delivery Equal to Veterinarians 1000 ml Jug

Quick Absorption
Net Wt. 60 cc (68 Grams)

Guaranteed Analysis:

Amino Acids

Arginine, min.	0.31%
Histidine, min.	0.22%
Isoleucine, min.	0.31%
Leucine, min.	0.68%
Lysine, min.	0.62%
Cystine, min.	0.22%
Methionine, min.	0.12%
Tyrosine, min.	0.48%
Phenylalanine, min.	0.39%
Threonine, min.	0.29%
Aspartic Acid, min.	1.61%
Alanine, min.	0.61%
Valine, min.	0.50%
Glutamic Acid, min.	2.90%
Proline, min.	0.69%
Glycine, min.	0.63%
Serine, min.	0.32%

1 Full Tube Contains:

Minerals/Vitamins/LB.

Calcium, min.	0.50%
Calcium, max.	0.70%
Sodium, min.	5.00%
Sodium, max.	6.00%
Magnesium, min.	0.50%
Potassium, min.	1.40%
Phosphorus, min.	0.40%
Copper, min.	350 ppm
Iron, min.	3500 ppm
Manganese, min.	350 ppm
Cobalt, min.	2 ppm
Zinc, min.	1000 ppm
Vitamin B_{12}, min.	1013 mcg
Menadione, min.	500 mg
Riboflavin, min.	81 mg
Pantothenic Acid, min.	46 mg
Thiamine, min.	992 mg
Niacin, min.	465 mg
Vitamin B_6, min.	37 mg
Inositol, min.	183 mg
Ascorbic Acid, min.	2000 mg

Ingredients: Water, Dextrose; Potassium, Amino Acid Complex; Salt, Ascorbic Acid, Magnesium Amino Acid Chelate, Calcium Amino Acid Chelate; Phosphorus, Amino Acid Complex; Menadione Sodium Bisulfate, Iron Amino Acid Chelate, Thiamine Hydrochloride, Niacinamide, Zinc Amino Acid Chelate, Inositol, Riboflavin, Pyridoxine Hydrochloride, Copper Amino Acid Chelate; Manganese Amino Acid Chelate; D-Calcium Pantothenate, Folic Acid; Cobalt, Amino Acid Complex; Vitamin B12 supplement, Xanthan Gum, Corn Oil, Sorbic Acid (a preservative).

DIRECTIONS: Give 1 full tube before or after an event to replenish vitamins, minerals and amino acids lost during excessive exercise or heat. Give ½ tube before and after light workout or during hot weather to prevent dehydration. Provide access to fresh water at all times.

Here's my example…

In this example, Arginine is listed as 0.31%, Iron is 3500 ppm, Vitamin B12 is 1013mcg/lb, and Thiamine is 992mg/lb. *(…No, it doesn't make much sense to me either…Yes, stop now and go get that glass of wine!)* Here's where we will start to make some sense of this stuff.

You will need to convert all the units to milligrams per gram (mg/g) or whatever units you understand. (In NZ, we use the metric system.) I generally convert everything to mg/g, as I have entered the nutrient requirements into my spread sheet in milligrams (mg) *(more on that later)*, and the dose of product you will give your horse will mostly be measured in grams (g). You can use the conversion factors here or google each nutrient.

A percentage, as you know, is a number out of 100, so a percentage is the same as an amount in milligrams per 100 milligrams or the amount in grams per 100 grams or the amount of green apples per 100 total apples. Make sense? Then, there are 1000 milligrams (mg) per gram (g), so we have to multiply the amount per 100 mg by 10 to get the amount per gram.

Conversion Factor for Percentages to mg/g

% x 10 = mg/g

OK, in this example, Arginine is listed as 0.31% so that means there is 0.31mg per 100 mg. We multiply this by 10 to get 3.1mg of Arginine per gram of paste.

Parts per million (ppm), using the apple analogy, is the amount of green apples per 1 million apples. So that is the same as the amount in micrograms per gram. There are 1000 micrograms (mcg) per 1 milligram, and there are 1000 milligrams in a gram, so there are 1 million micrograms in a gram. Anything listed in ppm, therefore, can automatically written instead as mcg/g. We, of course, are working towards having everything in mg/g, so divide the amount in ppm by 1000 to get the amount in mg/g.

In this example, the Iron is listed as 3500ppm. That's the same as 3500 mcg/g. If we divide by 1000 to get mg/g, there is suddenly only 3.5mg/g. That doesn't sound like nearly as much.

Conversion Factor for Parts Per Million to mg/g

ppm divided by 1000 = mg/g

Now, on to the vitamins in this example…

As we learned before, there are 1000 micrograms (mcg) per 1 milligram. Divide the amount in micrograms by 1000 to convert to mg. In this example, Vitamin B12 is actually 1.013mg/lb. Easy!

Conversion Factor for micrograms (mcg) to mg

1000 mcg per mg
amount in mcg divided by 1000 = amount per mg

Whoa! Not so fast. That's 1.013 milligrams per *pound*. Now I didn't grow up with the Imperial system, so I had to think about that one. There are 2.2 pounds per kilogram, and there are 1000 grams in each kilogram. First multiply by 2.2 to find out how many milligrams are in a kilogram (1.013 x 2.2 = 2.23mg per kilogram) and then divide by 1000 to find out how many milligrams are in a gram. It turns out, there are 0.00223 mg/g.

Conversion Factor for kilograms (kg) to grams (g)

1000 grams per kg
amount in kg divided by 1000 = amount per g

Conversion Factor for milligrams per pound to mg/g

mg/lb x 2.2 and divide by 1000 = mg/g
or…… mg/lb x 0.0022 = mg/g

Thiamine (Vitamin B1) is already in mg…thank you very much!! However, it is also listed per pound, so as we learned above, multiply by 2.2 and divide by 1000. You can fill in Thiamine on your spreadsheet as 2.18mg/g.

You can then just repeat this process for everything listed on the label.

There are a few conversions that I haven't included here. International Units (iu) are frequently used as a unit of measure for vitamins, medications, hormones, and other biologically active substances. These are different for every form of vitamin as they include a measurement of effectiveness or biological activity. I have to look the conversion factors up every time I have to use them, and the best place to find them is on Google. So you don't have to look them up, here are a few of the main ones.

Nutrient	Amount in 1 iu	Amount in 1000 iu (IU or kiu)
Vitamin A (as Retinol)	0.3 mcg	300mg
Vitamin A (as Beta-carotene)	3.6 mcg	3600mg
Vitamin C	50mcg	5000mg
Vitamin D	0.025 mcg	25mg
Vitamin E	0.67 mg	670mg

3. Convert the contents per kg, L, g, oz, or pound to the content per dose.

If you have converted the contents to mg/g and the dose is in grams, just multiply your quantity in mg/g by the dose. If you have converted to mg/kg, then multiply your quantity by the dose and divide by 1000. (There are 1000 grams per kg).

We have already calculated the contents in mg per g, so we just have to work out how many grams are in our dose and multiply by that number. In this example, there are 68 grams (1 full syringe) per dose.

Arginine = 3.1mg/g x 68 g = 210.8mg per dose syringe
Iron = 3.5mg/g x 68 g = 238 mg per dose syringe
Vitamin B12 = 0.00223mg/g x 68g = 0.152 mg per dose syringe
Vitamin B1 (Thiamine) = 2.18mg/g x 68g = 148.24mg per dose syringe

Conversion for mg/g to Contents of a Dose

Amount in mg/g x grams in a dose

4. Write down the nutrient requirements for your particular horse, at the specific level of work and stress they are under. In my spread sheet, I have included the requirements for a 450 kg horse in intense work. Those requirements will work fine for a Standardbred at 400-450 kg, a flat racehorse at 500-550 kg, or a sport horse at 550-600kg, but you can look up the precise requirements that pertain to your horse. National Research Council (NRC) is the best resource, but you can check out our Blog, Google, nutrition books, or ask an expert (nutritionist, veterinarian, etc).

5. Compare the contents per dose that you calculated to the nutrient requirements you looked up just now.

   Your average horse needs about 400mg Iron per day and there is 238mg in this dose. That's not bad.

   Doses of thiamine required to support nerve cell function are 1000mg upwards, so the 148mg in this fall a bit short.

While that seems complicated, it is really the only way to do it. If you do it a few times and get comfortable with converting units and doing the basic mathematics, and if you have some of the basic nutrient requirements committed to memory, then you can do a rough comparison in a feed store.

Quick and Dirty Method

Most commonly, companies based in countries that use the metric system list their contents in mg/kg. Divide the contents by 1000 to get to mg/g and multiply by the dose.

For example, we will use a dose of 50g. As there are 1000 grams in a kilogram, then your 50mL dose has about 1/20th of the contents on the label (50/1000 is about 1/20$^{th)}$. You can just divide the quantity on the label by 20 to get a rough idea of what is in a dose and then compare that to what you remember of the requirements.

If the label is more complicated, then I do the calculations for one nutrient and then figure out what to multiply or divide the label quantities by to get what is in a dose. Then I apply that factor to all of the nutrients. Easy!

In our example, nutrients listed as percentages can be multiplied by 680. In your spread sheet, you can multiply the column of percentages by 680 and the results are half done.

In general, divide nutrients listed in ppm by 1000 and then multiply by the dose in grams.

In our example, the nutrients listed as ppm can be divided by 1000 and multiplied by 68…or just multiply by .068. (68 divided by 1000).

The nutrients listed as mg/lb can be multiplied by the dose and 2.2 and then divided by 1000 or just multiplied by 0.15.

The hard part is done. You can now easily compare the quantities in any product with nutrient requirements and see for yourself if each product in questions measures up and which ones looks to be the best. To really make a fair comparison, though, you will still have to learn something about what nutrients to look for and why they must be in optimal doses; neither too much nor too little.

Next, you must consider the composition and balance of nutrients in the product, so read on… once you have recovered from the mathematical ordeal!