Bioavailability of USANA® Essentials™ versus Four Select Competitor Products

Natalie Eich, Erik Schneider, Toni McKinnon, Brian Dixon, John Guomo, Tim Wood
USANA Health Sciences, Inc., Salt Lake City, Utah

Introduction
In the supplement industry, products can be rated based on the number of nutrients provided at an efficacious level and the bioavailability of said nutrients. Bioavailability is defined as the degree and rate at which a substance is absorbed into a living system or is made available at the site of physiological activity. What good does it do to take a supplement if it is not effective due to low amounts of nutrients or poor bioavailability? A simple way to examine the quality of a health supplement is to examine its bioavailability—a superior nutraceutical has superior bioavailability.

Some supplement companies make considerable claims about the bioavailability of their supplements, claiming that they are more efficiently absorbed. A few companies go even further and state that their "novel delivery systems" allow their products to be more bioavailable despite having low concentrations of select nutrients. Other companies suggest that the nutrients they use in their products are "natural" or "food-derived" and, therefore, are more bioavailable than conventional formulations. The purpose of this study was to assess whether blood levels of select key nutrients could reach similar levels after supplementation with 5 diverse dietary supplements.

Four products were analyzed relative to USANA’s Essentials™ vitamin, mineral, and antioxidant supplement: 1) a plant-based vitamin/mineral supplement utilizing minerals obtained through hydroponic cultivation; 2) a food-based supplement consisting of dehydrated fruits and vegetables; 3) a leading single daily vitamin/mineral tablet containing up to the RDA levels of select key nutrients; 4) a gel-based vitamin/mineral supplement containing up to the RDA levels of vitamins and minerals.

Materials and Methods

Study Design
This study was a crossover study that consisted of 10 healthy adult volunteers (8 males, 2 females), ranging in age from 26–50. One supplement was evaluated each week for a total of 5 weeks. Each product was given as directed to include the manufacturer’s recommended number of tablets per day and the bioavailability of said nutrients. Bioavailability is defined as the degree and rate at which a substance is absorbed into a living system or is made available at the site of physiological activity. What good does it do to take a supplement if it is not effective due to low amounts of nutrients or poor bioavailability?

Results
For every nutrient examined, the USANA Essentials had the best bioavailability profiles. The Essentials produced the largest change in blood levels of ascorbic acid, 15% greater than the next closest product and ranged between 64% to 73% greater than all the other examiners (p = 0.046) (Figure 1A). For riboflavin, the mean area under the curve (AUC) was the greatest after supplementation with USANA’s Essentials. There was a 56% greater absorption of riboflavin than the next closest competitor and 96% over the worst (Figure 1B).

Supplementation with the Essentials also had the best absorption of vitamin B6. The AUC was at least 12% higher than all of the competitors. The juice-based product did not change the blood levels of vitamin B6 at any of the time points following supplementation, indicating that either this product contained no vitamin B6 or poor, if any, bioavailability (Figure 1C).

In terms of a functional endpoint, plasma antioxidant reserve, a measure of resistance of plasma to oxidative stress, was measured. Supplementation with the USANA Essentials produced a 13% increase in PAR over the next closest competitor. The other 3 supplements had only a minimal effect on PAR (Figure 2).

Conclusions/Discussion
The USANA Essentials outperformed the other products tested by providing the highest levels of key nutrients in the most efficacious forms. The gel-based, plant-matrixed, and leading daily supplement differed in the amount of nutrients they contained and their labeling. However, it appears that neither the “novel delivery system” nor the various sources of the raw materials affected the bioavailability of the nutrients analyzed for these 3 products. The Essentials provided the largest increase in circulating concentrations for all three nutrients examined. Interestingly, the leading daily multivitamin produced a larger absorption curve for riboflavin than the plant-matrixed, juice-based, and gel-based products, even though all 4 products contain the same amount of riboflavin in their formulations. As seen in the vitamin C curve, only the juice-based product produced an absorption curve that approached that of the Essentials. Plasma antioxidant reserve seems to match the curve for vitamin C, suggesting that PAR is heavily influenced by vitamin C status.

Studies where multiple doses are given over a longer period of time could also provide insight into the absorption of fat-soluble vitamins, such as vitamin D, coenzyme Q10, vitamin K, and the carotenoids, as these vitamins take longer to accumulate in the body. It also appears that for vitamin C, riboflavin, and vitamin B6, the Essentials not only had the best absorption, but also maintained increased levels of the nutrients longer over the time period examined. Therefore, it appears that the USANA Essentials provides optimal levels of the most bioavailable forms of nutrients to obtain blood levels significantly higher than the competition. Thus, if taken twice daily, one could expect to maintain elevated levels of these nutrients throughout the day to help obtain optimal nutritional status.

Table 1. Products analyzed for select nutrients

<table>
<thead>
<tr>
<th>Product ID</th>
<th>Product Name</th>
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</thead>
<tbody>
<tr>
<td>USANA Essentials</td>
<td>Plant-matrixed</td>
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<tr>
<td>Juice-based</td>
<td>Leading Daily Multivitamin</td>
</tr>
<tr>
<td>Gel-based</td>
<td></td>
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</tbody>
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