The Dietary Supplement Ingredient Database (DSID): Comparison of Adult and Children's MVM Products

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DSID Dietary Supplement Ingredient Database A U.S. Government Initiative

Abstract

In the Dietary Supplement Ingredient Database (DSID), ingredients in dietary supplement products are chemically analyzed and the results statistically evaluated for nutritional applications. The first data release, DSID-1, reported on 18 ingredients in adult multivitamin/multimineral (MVM) products. Recently, children's MVMs were studied. Representative products were identified using National Health and Nutrition Examination Survey (NHANES) 2003-06 and current market data. Differences between adult and children's MVM products include product forms, nutrient ranges and total nutritional content. Adult MVMs reported in NHANES had median values of 12 vitamins and 7 minerals; children's MVMs had median values of 10 vitamins and 2 minerals. Multiple lots of >60 children's MVMs were purchased in 2008 using a nationwide sampling plan and analyzed with certified reference materials. Adult products showed a wider range of nutrient values than the children's. For 17 nutrients, the range for adult MVMs was 1.4 – 14.8 times the range for children's products. For 4 B vitamins (B12, B6, riboflavin, thiamin), the range for adult MVMs was >30 times that of the children's MVMs. Preliminary analytical results for 12 nutrients in children's products, calculated as % difference from label, show some distinct differences when compared to adult MVM products. Funding: ARS/USDA & ODS/NIH Y1CN501006

Introduction

The Nutrient Data Laboratory, Beltsville Human Nutrition Research Center, Agricultural Research Service, U.S. Department of Agriculture, has been working with the Office of Dietary Supplements, National Institutes of Health and other federal agencies to plan and develop a Dietary Supplement Ingredient Database (DSID) to evaluate levels of ingredients in dietary supplement products.

The first major product of this research is a publicly available dietary supplement ingredient database, DSID, released in April, 2009 including data for 18 vitamins and minerals in adult MVMs (MVMs defined as containing >2 vitamins, with or without minerals). The DSID-1 release includes data tables, data application tables, a research summary and an on-line adult MVM calculator. The web site is: (http://dietarysupplementdatabase.usda.nih.gov).

Methods

For both the adult MVM and children's MVM studies:

1. Representative Products were:
   - A. Identified using multiple surveys
   - B. Purchased:
     1. In retail outlets in 6 U.S. locations
     2. Through distributors or via the Internet (direct sales)
   - C. Repackaged and sent to qualified laboratories in planned batches
   - D. Analyzed for up to 21 vitamins and minerals
2. Laboratory precision and accuracy were evaluated using:
   - A. Standard reference materials
   - B. Blinded duplicates
   - C. In-house reference materials

Comparison of Product Label Information

Table 1 lists:

- Percentage of purchased products containing each nutrient
- Minimum, maximum and most commonly labeled % Daily Value (% DV) for each nutrient
- Ratio (Adult MVM/Children's MVM) of the nutrient ranges for each vitamin and mineral
  Note that for most of the children's products evaluated, the primary age group was children 4 years and older, thus the % DV for this group is the same as for adults.

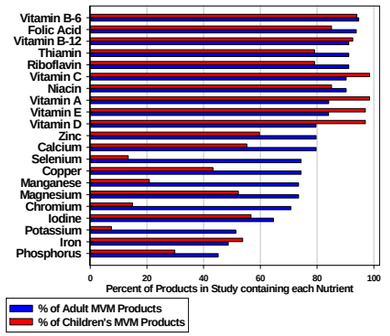
Figure 1 shows the % of each nutrient in the 2 product categories. Results:

- For 11 nutrients, the most commonly labeled level was the same for both product categories.
- The most notable difference between the 2 categories is in the ranges seen for each nutrient. Many adult MVM products had much higher levels of many of the vitamins and some of the minerals than in the children's MVM products.
- Water soluble vitamins (B vitamins, Vitamin C) and Vitamins A, D and E were present in 80% or more of products sampled regardless of intended user.

TABLE 1. Labeled Nutrient Information for Products in two MVM Studies

Nutrient	Study	% of Products Containing this Nutrient	Most Common % DV	Minimum % DV	Maximum % DV	Range Ratio (Adult/ Children)
Calcium	Adult	79.7	16.2	1.80	120	6
	Children	55.2	10	0.30	20	
Copper	Adult	74.3	100	1.5	250	2.5
	Children	43.3	100	2.5	100	
Chromium	Adult	70.8	100	8.3	166	3.5
	Children	14.9	16.7	4.2	50	
Folic Acid	Adult	93.8	100	12.5	200	1.9
	Children	85.1	100	2.5	100	
Iodine	Adult	64.6	100	6.7	133	1.4
	Children	56.7	100	8.5	100	
Iron	Adult	48.7	100	2	150	1.7
	Children	53.7	100	11.1	100	
Magnesium	Adult	73.5	25	0.325	100	8.3
	Children	52.2	5	0.5	12	
Manganese	Adult	73.5	100	0.5	800	8.2
	Children	20.9	50	2.5	100	
Niacin	Adult	90.3	100	45	1450	12.5
	Children	85.1	67.5	12.5	125	
Phosphorus	Adult	45.1	11	1.5	35	3.6
	Children	29.9	10	0.75	10	
Potassium	Adult	51.3	2	0.042	5	1.7
	Children	7.5	0.01	0.01	1.2	
Riboflavin	Adult	91.2	100	11.8	8823	34.1
	Children	79.1	100	35.3	294	
Selenium	Adult	74.3	29	14.5	290	2.9
	Children	13.4	29	5.4	101	
Thiamin	Adult	91.1	100	13.3	10000	33.3
	Children	79.1	100	33.3	333	
Vitamin A	Adult	84.1	70	5	300	4.2
	Children	98.5	50	30	100	
Vitamin B-12	Adult	91.2	100	16.7	16666	117
	Children	92.5	100	25	166	
Vitamin B-6	Adult	94.7	100	50	7500	32.4
	Children	94.0	100	20	250	
Vitamin C	Adult	90.3	100	6.67	4500	9.5
	Children	98.5	100	25	500	
Vitamin D	Adult	79.6	100	16.8	250	2.5
	Children	97.0	100	6.25	100	
Vitamin E	Adult	84.0	100	33.3	1333	14.8
	Children	97.0	50	12.4	100	
Zinc	Adult	79.6	100	2.67	266	2.9
	Children	59.7	80	10	100	

Figure 1. Percentage of each Nutrient In two MVM Studies

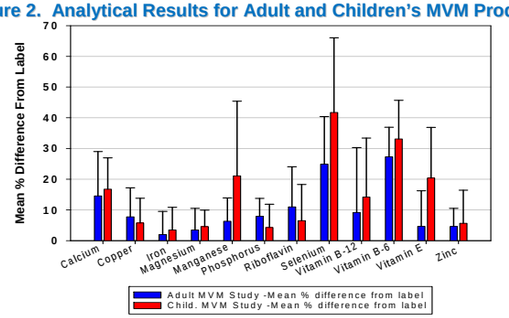


Comparison of Analytical Results

Product results for 12 nutrients analyzed to date are summarized in Figure 2. The overall mean % difference from label was calculated for each nutrient:

- Results for both studies are similar in mean % difference from label and among – product variability, identified here using error bars indicating one standard deviation (except for Vitamin E, manganese & selenium).
- For 3 of the 12 nutrients analyzed to date (copper, phosphorus & riboflavin), the mean % difference from label for the children's products was less than the mean % difference from label for the adult MVM products.

Figure 2. Analytical Results for Adult and Children's MVM Products



Conclusions and Future Plans

1. The means of all 12 nutrients with analyzed values for both children's and adult MVMs are above label, with some vitamins and minerals significantly higher than labeled levels.
2. Results for the remainder of the nutrients to be analyzed in MVM products, (vitamins C, D, vitamin A (both retinol and beta-carotene), potassium, folic acid, thiamin, niacin & chromium) will be finalized and reported in future publications and in the DSID-2 release in 2011.
3. Additional statistical analysis of children's MVMs will include regression analysis of results across the range of labeled levels and variability estimates.