The Dietary Supplement Ingredient Database: Results of USDA Pilot Studies

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Assessment of Intake

Supplement Intake

Food Intake

Component Values

Total Component Intake
USDA Database Products

- USDA National Nutrient Database for Standard Reference
- Database for national food and nutrition surveys
- Database for bioactive components
- Factors, guidelines, and protocols
NDL’s Foodcomp Web site

www.nal.usda.gov/fnic/foodcomp
NHANES: What We Eat in America

- National Health and Nutrition Examination Survey of nearly 5,000 individuals annually
- Food intake assessed with two 24-hour dietary recalls
- Supplement intake assessed over past month
- DS nutrient values obtained from labels
Assessment of Vitamin - Mineral Intake for Foods

**FOODS**
Standard Reference (SR)

**Food and Nutrient Database for Dietary Studies (FNDDS)**

**NHANES Food Intake Data**

**NHANES Nutrient Intake Reports**
Assessment of Vitamin - Mineral Intake for Foods and Dietary Supplements

**FOODS**
- Standard Reference (SR)
  - Food and Nutrient Database for Dietary Studies (FNDDS)
  - NHANES Food Intake Data
  - NHANES Food Nutrient Reports

**DIETARY SUPPLEMENTS**
- NHANES Dietary Supplement Label Database
  - Dietary Supplement Ingredient Database (DSID)
  - NHANES Supplement Intake Data
  - Supplement Ingredient Intake Data

**Total Intake of V + M**
NHANES
Dietary Supplement Database

- Database contains 6000+ products reported by respondents
- Products include multivitamins, single vitamins/minerals, botanicals, amino acids
- Nutrition information in database is based on label values
- Partnership with NCHS
Today’s Objectives

- Goals for a DSID
- Key Challenges
- Pilot Study Questions
- Pilot Study Accomplishments
- Future Plans
Goals for Dietary Supplement Ingredient Database

- To develop reliable estimates of nutrients and other bioactive components in Dietary Supplements
- To release and maintain on-line DS database
- To assess variability and/or possible bias in nutrient levels for DS
Key Challenges

- Categorization/Description
- Sample Handling
- Identifying Priorities
- Representative Sampling Plans
- Unique Matrix
- Methods and Reference Materials
- Qualified Labs
Categorizing Product Types

- Defining a dietary supplement
- Classifying various dietary supplements available
- Defining a multivitamin/multimineral (MVM)
- Partners with NCHS
Diverse Product Types

- Multivitamins
- Condition-specific products: joint health, bone health, memory
- Botanicals
- Weight-loss products
- Sport performance products
- Specialty products: amino acids, enzymes, melatonin, plant oils, glucosamine, probiotics
Distribution of Vitamin Count in Adult Multivitamin/Minerals*

*Distribution of vitamins (>2) indicates that the most commonly reported adult multivitamins (NHANES 1999-2000) contain 13 vitamins.
*Distribution indicates that most products reported (NHANES 1999-2000) are either single or double mineral products or are multivitamin/mineral products with 16 minerals.
Identifying priority components

Criteria considered:

- Frequency of consumption: NHANES
- Public health significance
- Status of methods and reference materials
- Federal agency interest
Highest Priority Categories

Multivitamins/minerals (MVMs)
Antacids
Calcium Supplements
Vitamin E
Vitamin C
B Vitamin products
Caffeine-containing products
Highest Priority “Tier 1” Ingredients

Folic Acid/folate
Calcium
Vitamin E
Vitamin A (Retinol)
Vitamin C
Iron
Beta Carotene
## “Tier 2” Ingredients

<table>
<thead>
<tr>
<th>Micronutrients</th>
<th>Trace Minerals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riboflavin</td>
<td>Potassium</td>
</tr>
<tr>
<td>Thiamin</td>
<td>Copper</td>
</tr>
<tr>
<td>Niacin</td>
<td>Selenium</td>
</tr>
<tr>
<td>Vitamin B6</td>
<td>Chromium</td>
</tr>
<tr>
<td>Vitamin B12</td>
<td>Manganese</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>Magnesium</td>
</tr>
<tr>
<td>Vitamin K</td>
<td>Zinc</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>Iodine</td>
</tr>
</tbody>
</table>
Representative Sampling Plans

Identify products: NHANES
Select across distribution channels
- Mass market retail
- Natural food and health stores
- Multi-level marketing
- Direct sales
Specific Methodology Issues for MVMs

- Unique matrix effects of capsules, pills, and gel caps
- Sample handling of MVMs for accuracy and precision
- Selection of valid methods
- Development of reference material
- Qualifying labs
Development of Reference Materials (RMṣ)

RM (known value) is measured along with sample MVM (unknown value)
NIST is developing an RM for DS
ODS, NIST, and FCL are partnering with NDL to:

Characterize SRMṣ
Review analytical methods
Qualify labs
Pilot Study Goals

**Pilot Study 1:** Survey laboratories for standard analytical methods. Identify sample handling protocols for MVMs to insure complete recovery.

**Pilot Study 2:** Assess capabilities of qualified labs to determine nutrient values of MVMs.
### Alpha-tocopherol Values for 2 Multivitamin/minerals and a Reference Material

<table>
<thead>
<tr>
<th>Products Analyzed</th>
<th>MVM 1</th>
<th>MVM 2</th>
<th>Reference Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>mg/g Alpha-tocopherol</td>
<td>45.00</td>
<td>35.00</td>
<td>3.00</td>
</tr>
</tbody>
</table>

**Lab Values**
- **Label Value**
- **Known Value**

**Graph Description**
- The graph illustrates the alpha-tocopherol values for two multivitamin/minerals (MVM 1 and MVM 2) and a reference material.
- Each product is analyzed by different labs (Lab 1, Lab 2, Lab 5, Lab 6).
- The bars represent the label values with error bars indicating variability.
- Known values are marked with a dotted line.

**Legend**
- Lab 1
- Lab 2
- Lab 5
- Lab 6
- Known Value
Levels of Alpha Tocopherol in Food and Supplements

- 1 Tbsp safflower oil = 5 mg alpha tocopherol* in natural form = 37% DV

- 1 oz dry roasted almonds = 7 mg alpha tocopherol* in natural form = 52% DV

- Common MVM = 30 IU (13.5 mg) synthetic alpha tocopherol = 100% DV

Coefficient of Variation (%) for Laboratories Analyzing Tier 1 Nutrients in a Multivitamin/mineral Product

Nutrients

- Folic acid
- A-tocopherol
- Iron
- Ascorbic Acid
- Calcium
- B-Carotene
- Retinol
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Next Steps: The “% DV” study

- Compare label and actual values of MVMs.
- Choose products at 3 or 4 DV levels.
- Analyze 5 products from each DV level.
- Measure 2 lots per product.
Example: Most Common % DV Levels for Calcium in Adult Multivitamins

*NHANES 01-02
Example: Most Common % DV Levels for Vitamin C in Adult Multivitamins

*NHANES 01-02
Comparison of % DV Label Claims vs. Laboratory Data, Theoretical Results

Theoretical Laboratory Data, %DV

Products labeled at 50, 100, 150 %DV
Application of Pilot Study Results

- Plans to analyze representative MVMs to support estimates for MVMs reported in NHANES.
- Validate composition data for generic classes of dietary supplements.
USDA Database Products

- USDA National Nutrient Database for Standard Reference
- Database for national food and nutrition surveys
- Database for bioactive components
- Factors, guidelines, and protocols
- Dietary Supplement Ingredients Database
Summary

Pilot studies can refine questions and focus research for the development of a dietary supplement ingredient database.
Acknowledgements

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http://Nutrition.gov
http://ods.od.nih.gov

DSID group
Questions?