Consequences of Changes in the Dietary Reference Intakes for Nutrient Databases

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USDA National Nutrient Database for Standard Reference (SR)

- 6,661 food items in SR16.1
- More than 2,600 used in the USDA Food and Nutrient Database for Dietary Studies (FNDDS)
  - Complete nutrient profiles for 61 food components (nutrients)
    - If analytical data are not available for any of these nutrients, NDL imputes a value
Folate

- \( g \) Total folate
- \( g \) Food folate
- \( g \) Folic acid
- \( g \) Dietary Folate Equivalents (DFE)

DFE = (\( g \) Folic acid \( \times \) 1.67) + \( g \) Food folate
Folate Methods

- Microbiological
  - Measures total folate

- HPLC
  - Folic acid
  - 5 methyltetrahydrofolate
  - 5 formyltetrahydrofolate
  - 10 formylfolic acid
  - 10 formyldihydrofolate
Calculation of DFEs for Cooked Rice

Total folate: 58 μg

Food folate: 3 μg * 1 = 3

Folic Acid: 55 μg * 1.7 = 94

97 μg DFE
Determination of Food Folate by Microbiological Assay

Total Folate – Folic acid = Food Folate

\[(1.7 \times \mu g \text{ folic acid}) + \mu g \text{ food folate} = \mu g \text{ DFE}\]
Folates reported in SR

- g Total folate
- g Food folate
- g Folic acid
- g Dietary Folate Equivalents (DFE)
<table>
<thead>
<tr>
<th>Requirement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAR for adults</td>
<td>320 µg/day DFE</td>
</tr>
<tr>
<td>RDA for adults</td>
<td>400 µg/day DFE</td>
</tr>
<tr>
<td>UL for adults</td>
<td>1,000 µg/day from fortified foods or supplements</td>
</tr>
</tbody>
</table>
## Vitamin A Activity

<table>
<thead>
<tr>
<th></th>
<th>International Units</th>
<th>Retinol Equivalents</th>
<th>Retinol Activity Equivalents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retinol <strong>g</strong></td>
<td>.3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>-carotene</strong> <strong>g</strong></td>
<td>.6</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Other active carotenoids <strong>g</strong></td>
<td>1.2</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>IU</td>
<td>RE</td>
<td>RAE</td>
</tr>
<tr>
<td>---------</td>
<td>-------</td>
<td>------</td>
<td>-----</td>
</tr>
<tr>
<td>Spinach</td>
<td>9,377</td>
<td>938</td>
<td>469</td>
</tr>
<tr>
<td>Chicken</td>
<td>137</td>
<td>41</td>
<td>41</td>
</tr>
</tbody>
</table>
Calculating Vitamin A in μg RAE for Cheddar Cheese

- Vitamin A: 278 RE
- Carotene: 20 RE / 2 = 10 RAE
- Retinol: 258 RE / 1 = 258 RAE

268 RAE
Carotenoids in Database

**Vitamin A active carotenoids**

- β-carotene
- Χ-carotene
- Ω-cryptoxanthin

- Lycopene
- Lutein+zeaxanthin
<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAR</td>
<td>625 g RAE/day</td>
<td>500 g RAE/day</td>
</tr>
<tr>
<td>RDA</td>
<td>900 g RAE/day</td>
<td>700 g RAE/day</td>
</tr>
<tr>
<td>UL</td>
<td>3,000 g/day of preformed vitamin A</td>
<td></td>
</tr>
</tbody>
</table>
Vitamin E

- 
  - \( 
  \) -tocopherol equivalents
  - \( 
  \) -tocopherol
  - \( 
  \) -tocopherol
  - \( 
  \) -tocopherol
  - \( 
  \) tocotrienol

- mg \( 
  \) -tocopherol
Vitamin E isomers in various vegetable oils

Tocopherol content (mg per 100 g)

- Safflower
- Canola
- Olive
- Corn
- Soybean

alpha | beta | gamma | delta

0 50 100 150
Soybean oil example
(values per 100g)

8 mg α-tocopherol \times 1 = 8
1 mg β-tocopherol \times 0.5 = 0.5
72 mg γ-tocopherol \times 0.1 = 7.2
23 mg δ-tocopherol \times 0.03 = 0.69

Vitamin E, ATE 16.39
Added Vitamin E

- *All rac*-tocopherol (Historically and incorrectly labeled *dl*-tocopherol)
  - IU * 0.45

- *RRR*-tocopherol (Historically and incorrectly labeled *d*-tocopherol)
  - IU * 0.67
Identification of Added Vitamin E on Ingredient Labels

Breakfast cereals, infant formulas, peanut butter, breakfast powder:

- Vitamin E acetate
- Alpha-tocopherol acetate
- Tocopheryl acetate
Identification of Added Vitamin E on Ingredient Labels

Energy/protein bars:

6  no vitamin E added
7  vitamin E acetate
5  alpha tocopherol acetate
6  dl-alpha-tocopheryl acetate
1  d-alpha-tocopheryl acetate
1  natural vitamin E acetate
1  d-alpha tocopheryl acetate & dl-alpha tocopheryl acetate
Vitamin E DRI

**EAR** for adults  12 mg/day of \( \alpha \)-tocopherol

**RDA** for adults  15 mg/day of \( \alpha \)-tocopherol

**UL** for adults  1,000 mg/day of any form of supplementary \( \alpha \)-tocopherol
Conversions for Added Vitamin E

- **Synthetic vitamin E** also called *All rac* or *DL* \( \alpha \)-tocopherol
  - Comparison to RDA or EAR
    - IU * 0.45
  - Comparison to UL
    - IU * 0.90

- **Natural vitamin E** also called RRR or D \( \alpha \)-tocopherol
  - Comparison to UL same as RDA and EAR
    - IU * .67
Vitamin B-12 DRI

EAR for adults* 2 μg /day

RDA for adults* 2.4 μg /day

UL for adults none established

*For adults ages 51 years and older it is recommended that B-12 fortified foods or supplements be used to meet the requirements.
## DRI for Niacin

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>EAR</strong></td>
<td><strong>Men</strong></td>
<td>12 mg/day niacin equivalents</td>
</tr>
<tr>
<td></td>
<td><strong>Women</strong></td>
<td>11 mg/day niacin equivalents</td>
</tr>
<tr>
<td><strong>RDA</strong></td>
<td><strong>Men</strong></td>
<td>16 mg/day niacin equivalents</td>
</tr>
<tr>
<td></td>
<td><strong>Women</strong></td>
<td>14 mg/day niacin equivalents</td>
</tr>
<tr>
<td><strong>UL</strong></td>
<td><strong>Adults</strong></td>
<td>35 mg/day of niacin*</td>
</tr>
</tbody>
</table>

*Intake of niacin as a supplement or food fortificant*
## Units for RDAs

<table>
<thead>
<tr>
<th>Year</th>
<th>Folate</th>
<th>Vit. A</th>
<th>Vit. E</th>
<th>Vit. B12</th>
<th>Niacin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1968</td>
<td>mg</td>
<td>IU</td>
<td>IU</td>
<td>g</td>
<td>mg NE</td>
</tr>
<tr>
<td>1974</td>
<td>g</td>
<td>RE</td>
<td>IU</td>
<td>g</td>
<td>mg</td>
</tr>
<tr>
<td>1980</td>
<td>g</td>
<td>RE</td>
<td>&lt;-TE</td>
<td>g</td>
<td>mg NE</td>
</tr>
<tr>
<td>1998 - 2001</td>
<td>DFE</td>
<td>RAE</td>
<td>mg</td>
<td>g</td>
<td>mg NE</td>
</tr>
<tr>
<td>SR Nutrients</td>
<td>Before New DRI</td>
<td>After New DRI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Folate, total</td>
<td>Folate, total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Food folate</td>
<td>Folic acid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vitamin A, IU</td>
<td>Vitamin A, IU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vitamin A, RE</td>
<td>Vitamin A, RAE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vitamin E, -TE</td>
<td>Retinol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-carotene</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>-carotene</td>
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<td></td>
<td></td>
<td>-cryptoxanthin</td>
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<tr>
<td></td>
<td></td>
<td>Vitamin E, -tocopherol</td>
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</tr>
</tbody>
</table>
When did you say they are going to start the next revision of the DRIs?!!
# Differences in Units for Reporting Nutrients

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Current DV</th>
<th>Proposed DV*</th>
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</thead>
<tbody>
<tr>
<td>Folate</td>
<td>400 µg</td>
<td>314 DFE</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>5,000 IU</td>
<td>529 RAE</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>30 IU</td>
<td>12 mg</td>
</tr>
<tr>
<td>Vitamin B-12</td>
<td>6 µg</td>
<td>2 µg</td>
</tr>
</tbody>
</table>

*DRI Guiding Principles for Nutrition Labeling and Fortification