**Food for Thought**

**Health benefits of selected minerals**

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**Question**
Do patients need to take multivitamin or mineral supplements? How were the new Dietary Reference Intakes (DRIs) for minerals and vitamins set? What is the relationship between mineral supplements and optimum health?

**Answer**
Daily multivitamin and mineral supplements containing approved levels of minerals are safe for nearly everyone, but use of supplements should include individual risk assessment. The DRIs are reference values used primarily to assess and plan diets; they do not address amounts proposed for optimum health. The literature does, however, indicate that certain vitamins and minerals benefit health.

**Definitions**

*Dietary Reference Intakes.* The DRIs are four nutrient-based reference values: estimated average requirement (EAR), recommended dietary allowance (RDA), adequate intake (AI), and tolerable upper intake level (UL).

**Estimated average requirement.** The EAR is the average daily intake estimated to meet the nutritional needs of half the apparently healthy people of a certain age and sex. Amount needed is determined by a specific indicator or criterion of adequacy, for example, to maintain balance or maximize enzyme activity.

**Recommended dietary allowance.** The RDA is the average daily intake estimated to meet or exceed the nutritional needs of nearly all apparently healthy people of a certain age and sex. The RDA is usually set by adding two standard deviations of the requirement distribution to the EAR.

**Adequate intake.** The AI is an intake goal set when there is insufficient evidence to set an EAR or RDA. The AI is based on experimentally determined intake levels or approximations of observed mean intake of groups of healthy people presumed to have adequate intake of a nutrient. The AI is expected to meet or exceed the amount needed to maintain a defined nutritional state or criterion of adequacy for nearly all healthy people of a certain age and sex.

**Upper intake level.** The UL is the highest average daily intake not likely to adversely affect most people. The UL is not a recommended intake but an amount that can be tolerated. For healthy people, intake above the RDA or AI has no established benefit. For people at risk or being treated for a deficiency, intake above the RDA or AI, but below the UL, is safe.

**Health benefits of selected minerals**

*Calcium.* The AI for calcium, based on the relationship between calcium intake and bone mass, is intended to provide maximum calcium retention. The AI was derived by examining balance studies and data on bone mineral density and

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### Table 1. Recommended intake, upper levels, food sources, and health benefits of selected minerals for adults ≥19 years

<table>
<thead>
<tr>
<th>MINERAL (UNIT)</th>
<th>RECOMMENDED DIETARY ALLOWANCE OR AVERAGE INTAKE</th>
<th>UPPER LEVEL</th>
<th>FOOD SOURCES</th>
<th>POSSIBLE HEALTH BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium (mg/d)</td>
<td>1000 if ≤50 y 1200 if ≥51 y 1000 if pregnant or lactating</td>
<td>2500</td>
<td>Dairy products, salmon, sardines with bones, fortified juices, beverages, almonds</td>
<td>Bone health, blood pressure, colon cancer, weight management, symptoms of premenstrual syndrome</td>
</tr>
<tr>
<td>Magnesium (mg/d)</td>
<td>420 if male 320 if female 350 if pregnant and ≤30 y 360 if pregnant and ≥31 y 310 if lactating and ≤30 y 320 if lactating and ≥31 y</td>
<td>350*</td>
<td>Legumes, nuts, whole grains, dark green vegetables</td>
<td>Hypertension, cardiovascular disease, osteoporosis, diabetes</td>
</tr>
<tr>
<td>Selenium (μg/d)</td>
<td>55 60 if pregnant 70 if lactating</td>
<td>400</td>
<td>Organ meats, seafood, poultry, meats, plant foods</td>
<td>Cancer, infectious and inflammatory disease, immunity</td>
</tr>
<tr>
<td>Zinc (mg/d)</td>
<td>11 if male 8 if female 11 if pregnant 12 if lactating</td>
<td>40</td>
<td>Red meats, oysters, whole grains</td>
<td>Immunity</td>
</tr>
<tr>
<td>Chromium (μg/d)</td>
<td>35 if male and ≤50 y 30 if male and ≥51 y 25 if female and ≤50 y 20 if female and ≥51 y 30 if pregnant 45 if lactating</td>
<td>Not determined</td>
<td>Bran cereals, meat, fish, poultry</td>
<td>Blood glucose control</td>
</tr>
<tr>
<td>Iron (mg/d)</td>
<td>8 if male 18 if male and ≤50 y 8 if female and ≥51 y 27 if pregnant 9 if lactating</td>
<td>45</td>
<td>Meat, fish, poultry, enriched breads and cereals</td>
<td>Cognition</td>
</tr>
<tr>
<td>Copper (mg/d)</td>
<td>0.9 1 if pregnant 1.3 if lactating</td>
<td>10</td>
<td>Organ meats, seafood, nuts, seeds, cocoa products, whole grains</td>
<td></td>
</tr>
<tr>
<td>Phosphorus (mg/d)</td>
<td>700</td>
<td>4000</td>
<td>Meat, fish, poultry, milk, eggs, processed foods</td>
<td></td>
</tr>
<tr>
<td>Fluoride (mg/d)</td>
<td>4 if male 3 if female</td>
<td>10</td>
<td>Fluoridated drinking water, tea, seafood</td>
<td></td>
</tr>
<tr>
<td>Iodine (μg/d)</td>
<td>150 120 if pregnant 290 if lactating</td>
<td>1100</td>
<td>Iodized salt, dairy products, seafood</td>
<td></td>
</tr>
<tr>
<td>Manganese (mg/d)</td>
<td>2.3 if male 1.8 if female 2.0 if pregnant 2.6 if lactating</td>
<td>11</td>
<td>Grain products, tea, vegetables</td>
<td></td>
</tr>
<tr>
<td>Molybdenum (μg/d)</td>
<td>45 50 if pregnant or lactating</td>
<td>2000</td>
<td>Legumes, grain products, nuts</td>
<td></td>
</tr>
</tbody>
</table>

* From sources other than food.
bone mineral content. The UL for calcium is based on studies that examined the risk of hypercalcemia and renal insufficiency. Most men and women ingest less than adequate calcium at any stage of life.

Inadequate intake can adversely affect bone health, but evidence suggests it might have other effects also (Table 1). Low-calcium diets can accelerate weight gain and fat accumulation; high-calcium diets can prevent fat accumulation. Epidemiologic evidence and at least one intervention study have shown that higher calcium intake lowers the risk of developing colon cancer. Table 1 gives a summary of important minerals.

**Magnesium.** The RDA for magnesium is based on studies of mineral balance. There is a need for additional research on magnesium’s role in preventing chronic disease and on the relationship between balanced intake of calcium, potassium, and magnesium and hypertension.

**Selenium.** Selenium requirements are based on the amount needed to maximize activity of the enzyme glutathione peroxidase, a selenoprotein that acts as an antioxidant. Recent evidence indicates that selenium intake above the RDA could provide important health benefits to those whose oxidative stress loads are high (eg, people with infectious diseases, such as HIV/AIDS, and those at high risk of cancer, particularly prostate cancer).

**Zinc.** The zinc requirement was set by factorial modeling of the amount needed to maintain function on the interaction between copper and high intake of zinc. Zinc is an important mineral for growth and development, but it also appears to improve immune function in elderly people who are often deficient in several micronutrients.

**Chromium.** The AI for chromium is based on estimated mean intake. A UL was not determined because few serious adverse effects have been noted with excessive intake of chromium from food. Chromium is being investigated for a role in maintaining blood glucose control and could be particularly important for people with type 2 diabetes.

**Iron.** The RDA for iron was set by factorial modeling based on the amount needed to maintain function even when ferritin stores are minimal. The RDA for adult women younger than 50 takes into account menstrual losses. The UL was based on gastrointestinal side effects associated with elemental iron, but does not apply to those being treated for iron deficiency. Recent studies have examined endurance athletes’ higher iron requirements. Runners, for example, might need 30% to 70% more iron due to losses from footstrike hemolysis and gastrointestinal blood loss. Some studies have shown that iron can improve the ability to learn, but more evidence is needed to determine its specific role. Iron deficiency anemia is a serious problem for certain at-risk groups.

Acknowledgment

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References

4. Teegarden D. Calcium intake and reduction in weight or fat mass. *J Nutr* 2003;133:249-51S.