Review of the Dietary Reference Intake for Calcium: Where Do We Go From Here?

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Abstract

In this article the science relied on to establish the Dietary Reference Intakes (DRI) specifically for calcium was examined. The latest dietary recommendations for the essential nutrients significant with respect to their roles in bone metabolism and health were reported in the *Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride (1997)*. For calcium an adequate intake was recommended because insufficient data were available at the time to determine specific Recommended Dietary Allowances (RDA). Dietary intake data and the controversies regarding the role calcium may play in other chronic diseases have also been discussed. Advances and continued dilemmas regarding these topics reported since the publication of the DRI were also addressed in this review. A recent Dietary Reference Intake Research Synthesis Workshop report identified an extensive range of suggested future research directions needed to improve our understanding of calcium and bone and health.

Key words not in title: Recommended Dietary Allowances, Adequate Intakes, Tolerable Upper Intake Levels, and Bone Nutrients
Introduction

Dietary Reference Intakes

The daily dietary intake recommendations reported in the Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride\(^1\) were values calculated with the goal of maintaining health and avoiding potential risks from nutrient toxicity. A panel of scientists and nutrition experts from the United States and Canada developed the dietary recommendations for calcium, along with other essential nutrients, based on analysis of the currently available scientific literature. The latest revisions of the Dietary Reference Intakes (DRI) expand upon and replace the 10\(^{th}\) edition (1989) of the United States Recommended Dietary Allowances (RDA) that the National Academy of Sciences first established in 1941. Canada also used this latest DRI report to update their Recommended Nutrient Intakes (RNI). DRI reference categories defined in Figure 1 are now used for diet evaluation and planning.

The science-based evidence used to establish the DRIs for calcium, as well as the other bone related nutrients, examined the role of these nutrients in the development and maintenance of bones and teeth. At the time some consideration was also given to the data describing the potential biological role of these nutrients in the prevention of other chronic diseases. But relatively little emphasis was given to these data since the Food and Nutrition Board (FNB) were unable to develop conclusions that could be agreed upon. This was not surprising since chronic disease is known to result from complex interactions among genetic, dietary, and other environmental factors. This review on dietary calcium requirements includes brief comments regarding what has been learned about this essential nutrient since the FNB report was published.

Since Adequate Intakes (AI) and not Recommended Dietary Allowances were set for calcium in 1997 it is time to revisit, ten years later, the controversies that surrounded the original
“second” tier recommendation for calcium. What science based evidence is needed? What have we learned since making our last recommendation? Also, considering the economic, marketing, pharmacological and educational effort invested in calcium there are many entities that have a “stake” in knowing which way a committee might go with the next revisions? Up? Down? Or stay the same? Potential changes may impact many, including school lunch budgets, menus, hospital menus, and educational materials.

**Calcium Overview**

Calcium, the most abundant element in the body, makes up only 1 to 2 percent of total body weight, yet more than 99% of it is found in teeth and bones. Calcium in hard tissue is primarily in the form of hydroxyapatite. The remainder is found in the blood, extracellular fluid, muscle, and other tissues critical to the functioning in vascular contraction and vasodilation, muscle contraction, nerve transmission, and glandular secretion. With the help of 1, 25-dihydroxyvitamin D, calcium is absorbed by active transport and can be absorbed by passive diffusion when calcium intakes are high. Calcium absorption, known to vary inversely with intake, is still insufficient in meeting body requirements when calcium is low. Calcium absorption varies throughout the lifespan, highest in infancy and then declining with advancing age. Some dietary factors hypothesized to play a role in calcium absorption rates include: prebiotic oligosaccharides, dietary fiber, phytate, oxalate, lactose, phosvitin peptides, and other dietary minerals. Determining the actual effects of these compounds on calcium bioavailability will continue to be an arduous task considering some are proposed to act as absorption enhancers and some as inhibitors, and some may interact with others.

**Calcium and Disease**
Chronic calcium deficiency due to poor dietary intake or absorption is considered by many to be a contributing factor in the loss of bone mass and development of osteoporosis.\textsuperscript{9} Peak bone mass occurs somewhere between the ages of 19 and 30 years. At this point, growth of the long bones has ceased but bone remodeling continues throughout life. This remodeling necessitates that an adequate calcium intake occurs throughout the life cycle to meet the needs of bone, a dynamic tissue. At the time the committee met this need was well established; however, what an adequate intake of calcium was throughout the stages of the lifecycle was not as firmly supported by the research literature.

**Calcium and Bone Mineral Density**

The DRI for calcium was primarily influenced by the belief that adequate calcium intake promotes high bone mineral density (BMD) and thus reduces risk of osteoporotic fracture. Recent studies have raised questions about the appropriateness of using the DRI for calcium to prevent osteoporosis the biomarker, the endpoint assessment, for all populations. This is due to reports that some populations have very low calcium intakes, low BMD and low rates of fracture risk\textsuperscript{10, 11}. Also, the association between low BMD and increased risk of osteoporotic fracture was reportedly not as strong across the general population as it was within ethnic groups\textsuperscript{12}. That means that BMD was correlated with fracture risk within an ethnic group, but when several ethnic groups were analyzed together this correlation was not as strong. For example, black women in the U.S. had a lower fracture risk than white women at every level of BMD and this population was also reported to have a lower calcium intake\textsuperscript{11}. Some of the lowest intakes of calcium and the lowest incidence of hip fracture have been estimated to be in China and India\textsuperscript{11}. Prentice\textsuperscript{13} suggests some of the confusion in this area may be due to the inappropriate use of BMD to define osteoporosis risk in a world-wide context rather than using fragility fracture as
the disease endpoint. Others have written that the ability to sustain bone health with lower calcium intakes was due to genetic differences, increased levels of exercise, greater soy consumption, differences in bone architecture and their interaction\textsuperscript{14, 15, 16}. Whatever the reasons for these reported differences the DRI committee and many medical related organizations currently recommend that all populations, no matter their ethnic or racial background, intake more calcium than they are currently\textsuperscript{17}. However, significant barriers exist which prevent the achievement of this dietary recommendation for many people; education, lactose intolerance and limited financial resources to name just a few.

**Calcium and Hypertension**

The relationship between calcium and hypertension has been examined to a lesser extent than the impact of calcium on bone health. One review of 22 intervention trials reported that calcium supplementation moderately decreased systolic blood pressure and had no significant effect on diastolic blood pressure in hypertensive adults. There appeared to be no effect of calcium on blood pressure in normotensive individuals\textsuperscript{18}. The Dietary Approaches to Stop Hypertension (DASH) trials reported a lowering of blood pressure through dietary modification. The DASH diet, compared to the average Western intake, emphasized fruits, vegetables, and low-fat dairy foods, included whole grains, poultry, fish, and nuts, and was reduced in fats, red meat, sweets, and sugar-containing beverages\textsuperscript{19, 20}. Moore et al.\textsuperscript{21} found a greater lowering of blood pressure using the DASH diet as compared to a control and a diet high in fruits and vegetables. This trial suggested that increasing calcium intake from the low levels found in the average western diet to those levels suggested by the current AI may help to reduce blood pressure in those that are hypertensive. Lin et al. also reported that the DASH diet improved markers of bone health in adults no matter their age, sex, race or blood pressure status.
However, this hypothesis needs testing since levels of many other dietary components besides calcium are different in the DASH diet\textsuperscript{22}. The DASH diet is quite different from the typical Westerner’s food intake: specifically, it is lower in total fat, saturated fat, and cholesterol, and higher in potassium, calcium, magnesium, dietary fiber, protein and many other phytochemicals.

**Calcium and Colon Cancer**

The influence of dietary calcium on colon cancer risk was not clear at the time of the DRI publication. Data was inconsistent regarding tumor growth with calcium supplementation. Clinical trials examining the effects of calcium intake or additional calcium supplementation on the risk of colon cancer were unavailable. Since then studies have used an array of calcium supplements that contribute 1.2 to 2.0 g of elemental calcium daily, however, no dose response data is available at this time. Multiple controlled research trials have found calcium supplementation to reduce the risk of adenoma recurrence which is considered to be a precursor to colorectal cancer\textsuperscript{23, 24}. The effect of calcium supplementation was proposed to aid in preventing the reoccurrence of adenoma in one of two ways; by binding with bile and fatty acids in the colon or by reducing the growth of colon epithelial cells\textsuperscript{25}. Research to date thus indicates that calcium supplementation may be of benefit to people with a previous history of adenomatous polyps, but a link with actual prevention of colorectal cancer has not been established\textsuperscript{26}.

**Calcium Recommendations**

For most men and women in Canada and the US the daily recommendation for calcium intake, the AI, was determined to be 1,000 mg per day, an intake level achievable through a well planned diet (Tables 1 and 2). The ideal method for determining dietary calcium recommendations for the public would be to find calcium intakes associated with the fewest
osteoporotic fractures, but well designed, large-scale, long term studies are not yet able to provide this information. The methodologies employed to date to determine calcium requirements were based on measurements of calcium retention from balance studies, factorial estimates of requirements, and more limited data on bone mass or bone mineral content changes. The DRI panel concluded that there was insufficient data to determine an EAR and therefore calculated an AI for calcium. The AI for calcium represents an approximation of the intake that appears to be sufficient to maintain adequate calcium status for various life-stage and gender populations. AIs were set as opposed to RDAs due to uncertainties in balance methodology, lack of agreement with observational and experimental data regarding intake, and lack of longitudinal data on calcium intake, calcium retention, and long-term bone loss and the interdependence assumed between these factors. For most adult life-stage groups, the current DRI is higher than previous recommendations; however, for infants and children through the age of three years the new AI is actually lower than the previous RDA\textsuperscript{1,27}.

Although calcium is essential in the diet, a tolerable upper intake level was set by the committee (Table 1). For most individuals intake of calcium exceeding 2,500 mg a day is difficult to achieve, unless dietary supplements are being consumed. Though there is concern that very high intakes of calcium may cause nephrolithiasis, i.e., kidney stones, well-controlled clinical studies supporting this causal relationship in healthy individuals were not convincing when the AI and UL for calcium intake were established\textsuperscript{1}. Epidemiological studies and a feeding trial have suggested that age, race and sex may influence this relationship\textsuperscript{28,29,30}. Specifically, calcium supplementation usage has been reported to not be associated with increased risk of kidney stones in a twin study\textsuperscript{31}.

**Factors Affecting Calcium Requirement**
There is sufficient evidence to support the role of exercise in increasing bone mass throughout adolescence and early adulthood and at least preventing bone loss in post-menopausal women\textsuperscript{32, 33}. Likewise, the lack of exercise, as seen in lengthy immobilization or exposure to an antigravity environment, has resulted in bone mass loss despite what was considered to be an adequate calcium intake. At the time the FNB set the AI there was insufficient evidence to suggest that physically active individuals have different calcium requirements than more sedentary persons. Studies since the committee met indicated that both very short- and long-term immobilization resulted in increased bone resorption and decreased bone formation even with adequate or elevated calcium intakes\textsuperscript{34, 35, 36}.

Some have hypothesized that greater activity levels result in an adaptation to lower intakes of calcium\textsuperscript{37}. If found to be true this may help explain why women in Asia have lower calcium intakes than their counterparts in the United States and Europe, but lower risk of bone fracture\textsuperscript{10, 38}. Murphy and Carroll\textsuperscript{39} reviewed the literature on the effect of physical activity and calcium intake and found evidence, though limited, that these two lifestyle factors may act synergistically on bone health. Additional research is needed to examine this hypothesis.

Additional dietary factors may also influence calcium adequacy and ultimately bone health. High sodium intakes have been reported to result in an increased calcium loss through the urine\textsuperscript{40}, presumed to affect calcium in bone over an extended period of time. Similarly, protein increased the urinary loss of calcium, and, conversely, low or poor protein intakes were associated with reduced recovery from osteoporotic hip fractures\textsuperscript{41}. Currently, there is no evidence to suggest making separate calcium recommendations based on dietary sodium, protein or any other nutrient intakes\textsuperscript{13, 42}. 
Caffeine has been reported to have a modest effect on calcium excretion; however, the Institute of Medicine\(^1\) did not make a specific recommendation for calcium intake in relationship to coffee and tea consumption. The FNB thought that any perturbation in calcium intake with caffeine consumption could be compensated for by additional dietary calcium. A recent review of this topic by Nawrot et al.\(^{43}\) suggested that 1 to 2 cups of coffee a day (< 400 mg of caffeine) do not significantly affect bone status or calcium balance as long as they are consuming at least 800 mg calcium a day. Since many U.S. and Canadian females ingest less than this amount of calcium from their daily diets this interaction is likely to receive continued review.

Women with low levels of estrogen often have altered calcium metabolism. For example, amenorrheic women (women without menstrual cycles) had reduced absorption, increased excretion, and lower bone mass when compared to eumenorrheic, or normally cycling women\(^{44}\). These effects on calcium balance have frequently been demonstrated in postmenopausal women also. The accelerated bone loss that occurred during menopause was not solely due to insufficient dietary calcium. Estrogen loss appeared to reduce the efficiency of calcium absorption. Likewise, evidence suggested that increasing calcium intake during this period did not necessarily prevent bone loss that occurred with menopause\(^1\).

Another subpopulation reviewed with regard to calcium nutriture was vegans. A recent literature review concluded that lacto-ovo vegetarians have normal bone mass\(^{45}\). Studies evaluating bone mass and calcium consumption in vegans compared to their meat-eating counterparts are still lacking. Additionally, the actual risk of osteoporosis in the various types of vegetarians needs study.

**Dietary Intake and Sources of Calcium**
When usual calcium consumption patterns were analyzed most groups consumed less than the recommended AI of 1000-1200 mg/day for adults and intakes tended to decline with advancing age. The richest sources of calcium come from milk and dairy products. Many plant foods are good sources of calcium but contain oxalic acid or phytic acid which interferes with calcium absorption (Table 2). Since it is often difficult for some individuals to get the AI for calcium from foods, supplementation may be beneficial. Supplement solubility is not as important as tablet disintegration. It appeared that calcium absorption from tablets providing calcium citrate, malate, carbonate, and tricalcium phosphate were similar to that of milk. However, the relationship of solubility to absorbability was weak. The absorption from supplements seemed to be greatest in doses of 500 mg or less. Since the committee reviewed this area mounting evidence has been published suggesting that intake of fermented vegetables, prebiotics (e.g., inulin), and probiotics increases the bioavailability of calcium from plant sources and thus recommendations may someday advocate greater consumption of such foods.

**Research Recommendations**

The research recommendations for calcium reported in the 1997 DRI report stated a need for more definitive data on the effect of calcium intake on mineral metabolism and peak bone mass, genetics and calcium intake interactions, the status of adult calcium intakes and skeletal, and nonskeletal, end point assessments, such as blood pressure, cancer risk, and diabetes, and the impact of calcium intake on the risk of developing kidney stones and recurrent stone development.

These research recommendations suggested continuing to use balance studies, but urged the use of tracers to estimate changes in calcium balance through defined markers such as fractional absorption, bone calcium content and turnover rates. The adaptation to changes in
calcium intakes should be followed both short term and long term studies with comprehensive
evaluation of biochemical measures of bone mineral content and metabolism. The influence of
genetic and ethnic factors on bone needs to be studied in relation to such factors as varying
dietary intakes, physical activity, and hormonal changes. The committee also acknowledged
interactions between calcium and other minerals, as well as the likelihood that calcium intake
may exert influence over other nutritional risk factors, i.e. fat intake. Likewise, calcium excesses
may exacerbate these relationships or, increase the likelihood of unhealthy imbalances. A recent
workshop offered an opportunity for experts to review the DRI for calcium and the related bone
nutrients and the research published during that ten year period. They defined a new research
agenda needed to refine our dietary recommendations for calcium\textsuperscript{48}. They supported the
continuing need for research emphasizing science based data on calcium and calcium’s
interactions with other nutrients and the cumulative effects on bone health and other indicators of
optimal health. Thus, better methodologies need to be developed for studying nutrients
impacting calcium nutriture throughout the life cycle. For example, improved methods for
determining and standardizing concentrations of vitamin D are needed to improve food
composition data for vitamin D. Also, improving our understanding of the impact of low
phosphorus intakes on calcium metabolism, particularly in the elderly, is needed and the effect of
increasing calcium through supplementation on the bioavailability of phosphorus is unknown.
Likewise, our understanding of the effect of phosphorus intakes on the effectiveness of anabolic
agents used in the treatment of osteoporosis will need to be studied. These advances will provide
more information regarding the role of calcium and related nutrients on other affected disease
states as well\textsuperscript{48}. 


Yet, a few fundamental questions still remain. As stated by Dr. Catherine Woteki at the recent workshop, we still may not know if the DRI paradigm, intended to improve the effectiveness of conveying nutrient intake adequacy to the US and Canadian populations, is the “right one”? Others attending the recent workshop asked if the rapid move to genomics will impact nutrient recommendations when we identify drastic changes in individuals’ nutrient metabolism or requirement. Also, questioned was the accuracy of the current use of extrapolation when adjusting calcium intakes for development in the young? And, are there new noninvasive methods yet to be developed that will improve our understanding of how to establish calcium recommendations for future populations? These questions and more have been made available to researchers as potential areas of study through an electronic database.

Conclusion

This review focused on the research supporting the DRI for calcium, a bone-health associated essential nutrient, along with a discussion of recent related findings. The DRI panel concluded that there was insufficient data at that time to determine an EAR and therefore calculate an RDA for calcium. The AI established for calcium represented an approximation of the intake that appears to be sufficient to maintain calcium nutriture. The discussion of recent related findings reflects the expanding research taking the prior focus on amounts needed to eliminate deficiency diseases forward to include the amount required to minimize the onset and impact of chronic diseases. For calcium, establishment of specific optimal intakes may become increasingly harder to define. Some of this difficulty will likely come from our expanding knowledge of the role nonnutritive compounds play in preventing chronic diseases such as osteoporosis and the synergistic actions between essential nutrients (such as calcium), and nonessential nutrients (such as soy isoflavones). Bone health involves not just calcium but many other nutrients and
hormones to work in concert. A balanced and healthy diet like DASH has shown improvements in markers of bone health in adults regardless of other factors. Determining the individual and synergistic activity of and between these essential nutrients and nonessential compounds in maintaining bone health will be a great challenge. In addition we are becoming increasingly aware that differences between individual’s genetic make-up impacts the effect of essential and nonessential dietary compounds on health. Therefore, by the time the DRIs for bone-related nutrients are revisited the FNB task will likely be even more difficult than that which the previous panel faced.
References


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Nutrient Database for Standard Reference, Release 19. Nutrient Data Laboratory Home
* Estimated Average Requirement (EAR) – is the average daily intake value for a particular nutrient for a given life stage and gender group. It is estimated to satisfy the nutrient intakes of approximately 50% of the persons in that particular life stage and gender group.

* Recommended Dietary Allowance (RDA) – The average daily intake level has not changed in definition from previous years. It is the intake level of a specific nutrient that will provide approximately all (97 to 98%) of the persons in a life stage and gender group with sufficient daily quantities to meet body needs.

* Adequate Intake (AI) – When data are not available to determine a specific EAR, needed to determine the RDA, the AI is set as the average amount of a nutrient expected to be sufficient to maintain health.

* Tolerable Upper Intake Level (UL) – To avoid nutrient toxicities, the highest amount of a nutrient that can be expected to be ingested safely, daily and not cause health risks or adverse reactions to almost all individuals in the general population is known as the UL.

Figure 1. Dietary Reference Intakes Reference Categories. Dietary intake recommendation categories developed for the purpose of setting estimated average intakes, recommended intakes, adequate intakes, tolerable upper limits for various populations on the basis of age, gender and physiological state in the United States and Canada¹.
<table>
<thead>
<tr>
<th>DRI Life stage</th>
<th>AI mg/d</th>
<th>UL mg/d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-6 mo</td>
<td>210</td>
<td>NE*</td>
</tr>
<tr>
<td>7-12 mo</td>
<td>270</td>
<td>NE</td>
</tr>
<tr>
<td>Children</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3 y</td>
<td>500</td>
<td>2500</td>
</tr>
<tr>
<td>4-8 y</td>
<td>800</td>
<td>2500</td>
</tr>
<tr>
<td>Boys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9-13 y</td>
<td>1300</td>
<td>2500</td>
</tr>
<tr>
<td>14-18 y</td>
<td>1300</td>
<td>2500</td>
</tr>
<tr>
<td>Girls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9-13 y</td>
<td>1300</td>
<td>2500</td>
</tr>
<tr>
<td>14-18 y</td>
<td>1300</td>
<td>2500</td>
</tr>
<tr>
<td>Men</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19-30 y</td>
<td>1000</td>
<td>2500</td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19-30 y</td>
<td>1000</td>
<td>2500</td>
</tr>
<tr>
<td>Men</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31-50 y</td>
<td>1000</td>
<td>2500</td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31-50 y</td>
<td>1000</td>
<td>2500</td>
</tr>
<tr>
<td>Men</td>
<td></td>
<td></td>
</tr>
<tr>
<td>51-70 y</td>
<td>1200</td>
<td>2500</td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
</tr>
<tr>
<td>51-70 y</td>
<td>1200</td>
<td>2500</td>
</tr>
<tr>
<td>Men</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;70 y</td>
<td>1200</td>
<td>2500</td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;70 y</td>
<td>1200</td>
<td>2500</td>
</tr>
<tr>
<td>Pregnancy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14-18 y</td>
<td>1300</td>
<td>2500</td>
</tr>
<tr>
<td>19-30 y</td>
<td>1000</td>
<td>2500</td>
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<tr>
<td>31-50 y</td>
<td>1000</td>
<td>2500</td>
</tr>
<tr>
<td>Lactation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14-18 y</td>
<td>1300</td>
<td>2500</td>
</tr>
<tr>
<td>19-30 y</td>
<td>1000</td>
<td>2500</td>
</tr>
<tr>
<td>31-50 y</td>
<td>1000</td>
<td>2500</td>
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</tbody>
</table>

*NE = Not established

Table 2. Calcium Content of Selected Foods Commonly Consumed in the U.S. in Common Serving Sizes.

<table>
<thead>
<tr>
<th>NDB No.</th>
<th>Description</th>
<th>Measure</th>
<th>Calcium (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>08077</td>
<td>Cereals, ready-to-eat, GENERAL MILLS, Whole Grain TOTAL</td>
<td>¾ cup</td>
<td>1104</td>
</tr>
<tr>
<td>01111</td>
<td>Milk shakes, thick vanilla</td>
<td>11 fl oz</td>
<td>457</td>
</tr>
<tr>
<td>11164</td>
<td>Collards, frozen, chopped, cooked, boiled, drained, without salt</td>
<td>1 cup</td>
<td>357</td>
</tr>
<tr>
<td>01085</td>
<td>Milk, nonfat, fluid, with added vitamin A (fat free or skim)</td>
<td>1 cup</td>
<td>306</td>
</tr>
<tr>
<td>01077</td>
<td>Milk, whole, 3.25% milkfat</td>
<td>1 cup</td>
<td>276</td>
</tr>
<tr>
<td>01036</td>
<td>Cheese, ricotta, whole milk</td>
<td>1 cup</td>
<td>509</td>
</tr>
<tr>
<td>11458</td>
<td>Spinach, cooked, boiled, drained, without salt</td>
<td>1 cup</td>
<td>245</td>
</tr>
<tr>
<td>01009</td>
<td>Cheese, cheddar</td>
<td>1 oz</td>
<td>204</td>
</tr>
<tr>
<td>16126</td>
<td>Tofu, firm, prepared with calcium sulfate and magnesium chloride (nigari)</td>
<td>¼ block</td>
<td>163</td>
</tr>
<tr>
<td>20046</td>
<td>Rice, white, long-grain, parboiled, enriched, dry</td>
<td>1 cup</td>
<td>102</td>
</tr>
<tr>
<td>16120</td>
<td>Soy milk, fluid</td>
<td>1 cup</td>
<td>93</td>
</tr>
<tr>
<td>16043</td>
<td>Beans, pinto, mature seeds, cooked, boiled, without salt</td>
<td>1 cup</td>
<td>79</td>
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