

Please refer to *Nutrition Reviews*, 1994;52:216-9 for the Food and Nutrition Board concept paper that discusses new approaches to the upcoming revision of the Recommended Dietary Allowances.

## The RDA Concept: Time for a Change?

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Fifty-one years ago, at the height of World War II, the National Research Council (NRC) published a six-page document entitled *Recommended Dietary Allowances* (RDAs).<sup>1</sup> Since then, the nine successive editions of the RDAs have become nutrition's gold standard—the most authoritative guide to the nutrient needs of people in the United States, used for an extraordinary variety of purposes.

The NRC's Food and Nutrition Board (FNB) will soon begin work on an 11th edition of the RDAs, the edition that will help to guide the practice of nutrition into the 21st century. How should the RDAs be defined for this new era? Should they retain their current focus, or is a new concept needed to reflect continuing progress in nutrition science? Should prevention of chronic diseases be considered in the development of new allowances? How should the needs of nutritionally vulnerable segments of the population, such as smokers and the elderly, be taken into account? Should the process of developing new RDAs be made more open and more "scientifically democratic"? Can efforts be made to ensure consistency between the RDAs and other recommendations?

All of these questions were considered at a workshop on future recommended dietary allowances held at Rutgers University on April 13, 1993.<sup>2</sup> The workshop participants discussed many aspects of the RDA concept and the process by which RDAs are developed and updated. Their strongest focus, however, was on the crucial question of whether concepts of chronic disease prevention

should be included in the development of future allowances.

### Micronutrients and Disease: The Recommendation Gap

Currently, the American public receives two distinct types of nutrition advice. One set of recommendations, as presented in the NRC report *Nutrition and Your Health: Diet and Health*,<sup>3</sup> *Dietary Guidelines for Americans*,<sup>4</sup> and the *Surgeon General's Report on Nutrition and Health*<sup>5</sup> emphasizes macronutrients and overall dietary patterns and their impact on chronic disease risk. The second set comprises the RDAs and focuses on micronutrients and the prevention of classic deficiency syndromes.

Neither set of recommendations addresses a topic that has been a key focus of nutrition research for more than a decade—the relationship between micronutrient intake and the prevention of nondeficiency diseases. Crucial developments in nutrition science have been ignored, such as the link between folic acid and neural tube defects, the role of calcium in the prevention of osteoporosis, and the potential protective effects of antioxidant nutrients against cancer, cardiovascular disease, and degenerative diseases of the eye. The dietary goals for chronic disease prevention do not include nutrient goals. In their current form, the RDAs do not address functions of nutrients other than the prevention of deficiency and are not intended to represent optimal intakes. The 1989 RDA subcommittee stated that "it is not possible at this time to establish optimal intakes."<sup>6</sup> Is it possible now, in the mid-1990s?

Many nutrition scientists would say that it is possible, or at least that steps can be taken in this direction. Some would like to see the RDAs reconceptualized as optimum intakes for disease prevention and health maintenance. Others would prefer to

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have two sets of allowances: one to prevent deficiency and the other for optimal health.

Dr. John Weisburger of the American Health Foundation has proposed an interesting concept in which the recommended allowances for nutrients would be designed not only for avoidance of chronic diseases, but also for optimal protection against environmental toxicants.<sup>7</sup> The 1989 RDA subcommittee took a step in this direction by acknowledging that cigarette smokers (who are exposed to one of the most concentrated sources of environmental toxicants) have lower serum levels of vitamin C. The subcommittee made the point that smoking seems to increase metabolic turnover of the vitamin.

If the new RDAs incorporate concepts of disease prevention, then it may be appropriate to consider the inclusion of allowances for some substances which, although not considered essential nutrients, are highly desirable for good health. For example, there was strong support at the Rutgers workshop for the establishment of a separate RDA for carotenoids. An RDA for dietary fiber might also be worthy of consideration.

### **Dietary Allowances or Nutrient Allowances?**

If the concept of the RDAs is to be updated, perhaps a name change is also in order. The Recommended Dietary Allowances have a prominent history, but their implication that the desired amounts of nutrients can and should be obtained solely from the diet may be outdated. Recent evidence suggests that for a few nutrients, it may be difficult or impossible to obtain optimal intakes from diet alone. Thus, in the future, recommended **nutrient** allowances may need to be distinguished from recommended **dietary** allowances.

Folic acid is a case in point. Most experts now agree that women of childbearing potential should consume at least 400 µg of folate daily in order to reduce the risk of bearing a child with a neural tube defect.<sup>8,10</sup> Elderly people may need a similarly substantial intake of folic acid in order to maintain normal plasma homocysteine levels.<sup>11,12</sup> Yet, most people do not obtain 400 µg of folic acid from their diets, because most people do not consume the recommended five to nine servings per day of vegetables and fruit.<sup>13</sup> Because the need to prevent neural tube defects is so critical, many health authorities agree that either folic acid fortification or supplementation is necessary.

It is at least theoretically possible to obtain optimal intakes of folic acid from a good diet. A future RDA committee, however, may have to consider a circumstance where it is impossible to obtain the desired intake of a nutrient from diet alone. One

such situation involves vitamin E and cardiovascular disease. If further research confirms preliminary findings from observational epidemiologic studies<sup>14,15</sup> and from clinical trials of effects on lipoprotein oxidation,<sup>16,17</sup> it may be necessary to conclude that vitamin E intakes of at least 100 IU/day are required for optimum protection against atherosclerosis. Such intakes may be difficult to obtain from even the most carefully selected diet.

### **Uncertainty Is Nothing New**

Difficulty in determining the exact amount of a nutrient that will provide maximum protection against disease is one reason why some nutrition scientists are reluctant to move toward a reconceptualization of the RDAs. Selecting a single numeric value to appear in a table of recommended allowances may be a problem, even for nutrients for which an ample intake is desirable, such as vitamin C and calcium.

What many observers do not realize, however, is that choosing a single number has *always* been problematic. The presence of specific values in an RDA table gives an illusion of precision that is not really justified. A close reading of 1989's *Recommended Dietary Allowances, 10th Edition* discloses that there is considerable uncertainty in the current allowances, even though prevention of chronic diseases was not taken into consideration at the time.

For example, the RDA subcommittee acknowledged that the vitamin C allowance was set "somewhat arbitrarily." About calcium the subcommittee stated that "an optimal intake is difficult to define ... it is not surprising that recommendations in different countries vary widely." For zinc, the setting of a recommended allowance was "beset with several uncertainties." For vitamin E, the data were so inadequate that the subcommittee had to abandon the usual procedure of estimating the average physiological requirement and then adding a safety factor. Instead, the subcommittee based its "arbitrary but practical" allowance primarily on customary vitamin E intakes.<sup>6</sup>

### **Approaches to Establishing RDAs for Disease Prevention**

Many people seem to believe that the establishment of RDAs aimed at disease prevention would be much more difficult than the determination of traditional RDAs, but this may not be the case. The task is not as daunting as it may at first appear. Since the majority of the nutrients in the RDA table have no known role in disease prevention, no change in the method of determining their recommended dietary allowance is necessary. For other

nutrients, there is already substantial agreement on levels of intake that would be considered optimal.

A variety of authorities in the United States and other countries have agreed that a folic acid intake of 400 µg/day is appropriate. Few nutritionists would object to setting the RDA at this level until further data become available, particularly because the RDA for folic acid was 400 µg for more than 20 years, decreasing to 180 µg in 1989.

There is also reasonable agreement on desirable calcium intakes. A decade ago, a National Institutes of Health Consensus Development Conference recommended a calcium intake of 1000-1500 mg/day.<sup>18</sup> This recommendation has stood the test of time so that RDAs within this range would probably be well received.

Dr. Paul Lachance has proposed setting RDAs for vitamin C, vitamin E, and carotene equal to the amount of these nutrients found in an "ideal" diet. For this purpose, an "ideal" diet is one that follows all of the current guidelines for the prevention of chronic disease, including the guideline that specifies consumption of at least five servings daily of fruits and vegetables. Diets of this type have been associated with reduced risks of cardiovascular disease and cancer, with the reduction in risk attributed to the presence of antioxidant nutrients. Using menus that follow United States Department of Agriculture (USDA) and National Cancer Institute (NCI) guidelines, it has been calculated that an ideal diet would provide 5.2–6.0 mg/day of carotene, 217-225 mg/day of vitamin C, and 23-27 IU/day of vitamin E.<sup>19</sup> Values in these ranges could be used as starting points for the determination of RDAs, to be adjusted up or down as additional data are published.

Would allowances established in this way be arbitrary? To some extent, they would. But as noted above, the RDAs for vitamin C and vitamin E are already arbitrary. The proposed new approach would almost certainly be an improvement over the current strategy. Another possible way to determine an RDA for antioxidants has been proposed by Dr. William Pryor of Louisiana State University.<sup>20</sup> He suggests setting the RDA at a level that avoids the free radical pathologies of inadequate intakes. Dr. Pryor notes, however, that the dose-response curves for antioxidant nutrients may be linear, making it difficult to choose the most appropriate value by this method.

### For Whom Are the RDAs Intended?

The current RDAs are intended for "practically all healthy persons."<sup>6</sup> It may be worthwhile to reconsider this aspect of the RDA concept. A large proportion of the general population cannot truly be

described as "healthy." About 30% of Americans smoke, and many drink to excess. Others have diabetes, elevated cholesterol levels, or high blood pressure.<sup>21</sup> After age 45, most people are not "healthy" in the strict sense of the word and relatively few qualify as having no chronic or acute problem.

Is the concept of an RDA that excludes large segments of the population really desirable? Or, should the RDAs be broadened to include individuals who are not acutely ill but who are at risk for nutrition-related problems? There is a precedent for establishing special RDAs for groups with increased nutrient needs. The FNB already does this for two such groups—pregnant and lactating women. Perhaps special RDA accommodations could be made for other conditions that increase nutrient needs, such as cigarette smoking, excessive alcohol intake, or long-term polypharmacy in the elderly.

The 1989 RDA subcommittee took a step in this direction with its recommendation (in the text of the report) that smokers consume at least 100 mg/day of vitamin C rather than the 60 mg recommended for other adults. Future editions of the RDAs might be improved if these additional recommendations were to appear in the widely published RDA table, as well as in the text of the *Recommended Dietary Allowances*.

### RDAs for the Elderly

One proposed change that would generate little disagreement is the establishment of separate RDAs for the elderly. The 1989 RDA subcommittee considered dividing older people into two groups: ages 51-69 and ages 70 and over, but had insufficient data to do so. At this time, however, greatly improved data are available.

Recent research indicates that the elderly have increased needs for several vitamins, including riboflavin, vitamin B6, vitamin B12, vitamin D, and folic acid.<sup>11,12</sup> Further information on the nutrient needs of the elderly will soon be available from a nearly completed study at the USDA Human Nutrition Research Center on Aging at Tufts University. A recent review of research in this field concluded that "nutritional and dietary knowledge of elderly people has expanded enough in the last decade to justify RDAs for 50-70 and ≥70 year-old-categories, at least for several vitamins."<sup>22</sup>

### Translating Science into Public Policy

Like the RDA concept itself, the mechanism for determination of the RDAs and other nutrition recommendations may need modification as we approach the 21st century. A smooth, timely process

for translating research findings into public policy is urgently needed. As Dr. Walter Willett pointed out at the Rutgers Workshop, the recent experience with folic acid and neural tube effects has dramatically illustrated the slowness of the current system.

Dr. Willett stated that the amount of scientific research relating folic acid and neural tube defects is "mind boggling" and that "in addition, the magnitude of the effect of folic acid supplementation on neural tube defects was enormous. It is likely that a nutrient effect this dramatic will never be seen again. Given all the positive data that had been obtained, it was discouraging to find that little action was being taken."

Very recently, some progress has been made toward incorporating new knowledge about folic acid into public health policy in the United States.<sup>23</sup> However, it is important to note that in mid-1994 after completion of the studies confirming the relationship between folic acid and neural tube defects,<sup>24-26</sup> the RDA for folic acid for women of childbearing age remains at 180 µg/day.

One possible approach to improving the timeliness of changes in the RDAs is to make updating the allowances a continuous process. Perhaps a mechanism should be devised which allows the RDA for each nutrient to be reconsidered as frequently—or infrequently—as scientific developments dictate. It should not be necessary to require a comprehensive scientific review of all the nutrients just because there is a compelling reason to update the allowance for a singular nutrient such as folic acid.

### **Opening up the RDA Development Process**

One welcome change in the process of establishing RDAs is the FNB's new willingness to accept outside input in its deliberations. Previous editions of the RDAs were determined by a closed process, and the committees that established the allowances did not include many well-recognized authorities. For example, much of the dissatisfaction with the 1989 RDA for calcium reflects the fact that there was no calcium expert on the RDA subcommittee, and calcium researchers had little opportunity to contribute their views. The current Board's intention to keep discussion as open as possible should prevent a recurrence of this type of problem.

### **Consistency with Other Recommendations**

Several speakers at the Rutgers workshop drew attention to the need for consistency in nutrient recommendations, both within the United States and internationally. This is not a new idea. To their credit, the members of the 1989 RDA subcommittee clearly made an effort to establish allowances which

would be consistent with and complementary to the recommendations of the NRC *Diet and Health* report, published the same year. Other types of consistency also need to be considered.

Trace minerals such as zinc, iron, nickel, chromium, and manganese harbor the potential for conflict between the RDAs and standards set by agencies that focus on toxic effects.<sup>27</sup> To determine a safe exposure level, toxicologists customarily determine the minimum amount of a substance that causes an adverse effect in animals or humans, and then divide this by a safety factor based on the minimum toxic dose established in either animals or humans. However, Mother Nature's margins of safety for some trace elements are narrower than those used in the toxicologic evaluation of synthetic substances. Dr. Carl Keen of the University of California at Davis pointed out at the Rutgers workshop that the level of manganese in an average bran muffin is high enough by Environmental Protection Agency standards for the product to be removed from the market! Greater coordination is needed between policy makers in both nutrition and toxicology if unnecessary confusion is to be avoided.

Ideally there should also be improved coordination among nations to determine nutrient recommendations. Humans in all parts of the world have the same nutritional needs. There is no scientific reason why a single set of international standards cannot be developed. International consistency would greatly facilitate free trade and food assistance programs. At a minimum, it would be desirable for Canada, Mexico, and the United States to agree on a set of nutrient allowances as part of the current effort to eliminate trade barriers among the three countries.

### **RDAs: The Past and the Future**

The late Dr. Jean Mayer frequently reminded people that nutrition is not just a science, but an agenda. The process of translating scientific findings into public policy is a crucial challenge for the nutrition community. Without it, our research has little meaning, and our desire to improve the quality of life cannot be fulfilled.

To some, the idea of substantially changing either the RDA concept or their developmental process may seem blasphemous. But, as Dr. Jeffrey Blumberg of Tufts University pointed out at the Rutgers workshop, "the men and women who developed the first RDAs in the mid-1940s never intended them to become a static instrument. The aims and objectives of the RDAs have been changing and evolving continuously over the years. It is reasonable and appropriate that this evolution and change in the RDAs continue. The task confronting

the Food and Nutrition Board this year is part of a long, historic process that has recognized change to be important and inevitable as scientific knowledge develops."

The covers of the current edition of the RDA book describe it as "the classic reference work for the nutrition, dietetic, and allied health professions . . . the most authoritative source of information on nutrient allowances for healthy people."<sup>6</sup> There is no question that past editions of the RDAs have earned these accolades. The challenge for the current FNB, and for those who will help with their work, is to maintain this standard of excellence during a time of rapid change in the science of nutrition.

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