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MISINTERPRETATION AND MISUSE OF THE RECOMMENDED DIETARY ALLOWANCES

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ALMOST four years have elapsed since the Table of Recommended Dietary Allowances (Table 1) was developed by the Food and Nutrition Board of the National Research Council.[2] In this period the table has served, as was intended, as a guide for good dietary planning in civilian life and in the armed services. Also, however, the table has been misused. Criticism of the so-called liberality of the recommendations is partly referable to such misuse.

In developing its recommendations the board was guided by evidence of three types. There were data respecting requirements obtained from experimentation with human subjects who subsisted on diets of predetermined composition. There was a considerable accumulation of information obtained in experiments with animals. There was much experience to indicate that all biologic standards exhibit a range of variation within zones of apparent normality, suggesting that recommendations of allowances of any nutrient, to be applicable to an entire population, would need to provide not for an average individual but for those normal persons whose requirements can be expected to exceed the average.

Misuse of the Table of Recommended Dietary Allowances has been based in part on the false assumption that failure of a diet—any diet—to provide the nutrients in the table in the quantities recommended

[1] Past chairman, at present vice-chairman, Food and Nutrition Board, National Research Council.

[2] Food and Nutrition Board, National Research Council. "Recommended Dietary Allowances." Reprint and Circular Series, National Research Council 115, January, 1943, pp. 6.

was *ipso facto* evidence of dietary inadequacy, or still worse, of nutritional abnormality. Thus, for example, if a dietary survey showed that a certain percentage of a population failed to receive the full allowance of ascorbic acid, the conclusion has been drawn unjustifiably that that same percentage of the population was receiving less than was required of this vitamin. The conclusion is unwarranted for the simple reason that the recommended allowances include a factor of safety of at least 30 per cent. to provide for persons whose requirements may be greater than the average and that persons with average or less than average requirements may obtain all the ascorbic acid that they require with something less than the allowance recommended. Advertisers of vitamin products are almost universally guilty of this type of misuse of the table. They say: "The recommendation is for such and such a quantity. Unless your diet provides such an amount you, Mr. X, will suffer the consequences thereof. You probably are not getting this amount, because surveys show that the diets of some large fraction of the population are defective in this respect. Therefore, Mr. X, you need our vitamins." Setting the recommendations as high as they were set may have encouraged exploitation of the public by such advertising. However, this objection is not good scientific ground for setting lower levels. Surely means can be found for stopping this admittedly undesirable exploitation without distorting the scientific basis respecting food requirements.

However, some critics of the Table of Recommended Dietary Allowances hold that certain goals are set so high as to make them unattainable with relatively liberal supplies of food. There may be truth in this assertion as applied to goals for thiamine and riboflavin in the higher calorie brackets; otherwise the goals can readily be reached with low-cost dietaries, provided foods are used which contain the nutrients that they ought to have—thiamine, riboflavin and niacin, for instance, in the case of flour—and that measures are undertaken to avoid excessive use of vitamin-poor foods, especially sugar, and to minimize loss and waste of nutrient content in cooking and other preparation to which foods are subjected.

Another group of critics consists of economists and administrators who make use of the figures in the table as reference points for policies of food production. They find embarrassment when recommendations for certain nutrients are higher than can be provided by the total food supply of given populations. The complaint is usually restricted to the level set for protein or for certain vitamins and thus resolves itself into recognition that the quality of the food produced is less than what is thought to be desirable to promote good national health. In certain instances, however, notably in the Orient, quantity as

TABLE 1

RECOMMENDED DIETARY ALLOWANCES.* FOOD AND NUTRITION BOARD, NATIONAL RESEARCH COUNCIL

	Calories	Protein grams	Calcium grams	Iron mg	Vitamin A*** I.U.	Thiamin (B_1) mg**	Ribo-flavin mg	Niacin (Nicotinic acid) mg	Ascorbic acid mg**	Vitamin D I.U.
Man (70 Kg)										
Sedentary	2,500					1.5	2.2	15		
Moderately active	3,000	70	0.8	12	5,000	1.8	2.7	18	75	†††
Very active	4,500					2.3	3.3	23		
Woman (56 Kg)										
Sedentary	2,100					1.2	1.8	12		
Moderately active	2,500	60	0.8	12	5,000	1.5	2.2	15	70	†††
Very active	3,000					1.8	2.7	18		
Pregnancy (latter half)	2,500	85	1.5	15	6,000	1.8	2.5	18	100	400 to 800
Lactation	3,000	100	2.0	15	8,000	2.3	3.0	23	150	400 to 800
Children up to 12 years:										
Under 1 year†	100/Kg	3 to 4/Kg	1.0	6	1,500	0.4	0.6	4	30	400 to 800
1–3 years††	1,200	40	1.0	7	2,000	0.6	0.9	6	35	†††
4–6 years	1,600	50	1.0	8	2,500	0.8	1.2	8	50	
7–9 years	2,000	60	1.0	10	3,500	1.0	1.5	10	60	
10–12 years	2,500	70	1.2	12	4,500	1.2	1.8	12	75	
Children over 12 years:										
Girls, 13–15 years	2,800	80	1.3	15	5,000	1.4	2.0	14	80	†††
16–20 years	2,400	75	1.0	15	5,000	1.2	1.8	12	80	
Boys, 13–15 years	3,200	85	1.4	15	5,000	1.6	2.4	16	90	†††
16–20 years	3,800	100	1.4	15	6,000	2.0	3.0	20	100	

* Tentative goal toward which to aim in planning practical dietaries; can be met by a good diet of natural foods. Such a diet will also provide other minerals and vitamins, the requirements for which are less well known.

** 1 mg thiamin equals 333 I.U.; 1 mg ascorbic acid equals 20 I.U.

*** Requirements may be less if provided as vitamin A; greater if provided chiefly as the pro-vitamin carotene.

† Needs of infants increase from month to month. The amounts given are for approximately 6–8 months. The amounts of protein and calcium needed are less if derived from human milk.

†† Allowances are based on needs for the middle year in each group (as 2, 5, 8, etc.) and for moderate activity.

††† Vitamin D is undoubtedly necessary for older children and adults. When not available from sunshine, it should be provided probably up to the minimum amounts recommended for infants.

well as quality may be inadequate. The United Nations Conference on Food and Agriculture,[3] which met in Hot Springs, Virginia, from May 18 to June 3, 1943, faced this problem quite correctly in their recommendation IX, which reads as follows:

> That the governments and authorities here represented adopt as the ultimate goal of their food and nutrition policy dietary standards or allowances based upon scientific assessment of the amount and quality of food, in terms of nutrients which promote health, and *distinguish clearly between these standards and the more immediate consumption goals which necessarily must be based upon the practical possibilities of improving the food supply of our populations.*[4]

When used as goals for food and nutrition policy or as consumption goals, the recommended allowances ought to be weighted by statistical breakdowns of the population, with classification by age, sex and degree of activity and statistics of the numbers of expectant and nursing women. This has not been done in certain instances; instead the allowances recommended for a moderately active adult man have been the figures to which reference has been made. The difference in the two sets of figures is considerable, as is shown in Table 2. Compared here are the original recommendations for a moderately active adult man and the weighted recommended allowances per capita daily calculated by application of population statistics to the original recommendations for age, sex and other factors supplied by the table of the Food and Nutrition Board. The weighted recommendations in this instance are those developed by the Joint Committee of the Combined Food Board.[5]

TABLE 2

DIETARY ALLOWANCES FOR A MODERATELY ACTIVE MAN AND FOR AN AVERAGE PERSON

	Calories	Prot., gm	Ca., gm	Iron, mg	Vit. A., I.U.	Thiamin, mg	Riboflavin, mg	Niacin, mg	Ascorbic acid, mg
Men moderately active	3,000	70.0	0.8	12.0	5,000	1.8	2.7	18.0	75.0
Weighted by Joint Committee:									
United States (1943)	2,531	65.2	0.94	11.7	4,560	1.45	2.1	14.5	70.7
Canada (1943)	2,544	66.1	0.96	11.8	4,590	1.45	2.1	14.5	71.3
United Kingdom (1943)	2,546	64.6	0.91	11.7	4,664	1.47	2.2	14.7	71.0

The study of the Joint Committee of the Combined Food Board showed that the nutrients at retail outlets available for civilian consumption per day for the United States, Canada and the United Kingdom for the period 1934–38 (or 1935–39) and for each subsequent year up to and including 1943, would with few exceptions meet the weighted recommendations. In the United States, the only exception related to riboflavin, which remained below 2.1 mg until the year 1943. In Canada, riboflavin remained below 2.1 until 1943 and ascorbic acid has been low (61.2 mg in 1943 instead of 71.3). In the United Kingdom, the supply of riboflavin barely met the weighted standard by 1943, and thiamine was low up to the time when mandatory use of the national wheat meal loaf was introduced. In the period 1934–1938, the thiamine supply was 1.2 mg per capita instead of 1.47 mg.

Some economists have expressed the wish to base allowances on minimal average requirements. Such allowances would mean that half the people concerned would require more and half the people less than the figure given but, assuming perfect distribution based on need, a food supply which met the average need would provide for all. It is not to be supposed, however, that perfect distribution can ever be obtained, and furthermore the individual himself has no way of knowing whether his needs are below average or above. Therefore, the only planning that can be countenanced is one that provides enough for all well persons, whether their requirements as related to the average are high or low.

Objections to the recommendations on the part of scientists have been fewer than was anticipated. Subsequent research has, on the whole, supported the conclusions reached in 1941. Attack, where it has come, has been on the allowances for riboflavin, thiamine and ascorbic acid. The values set for these three vitamins allowed a factor of safety. However, a similar factor of safety was applied to the recommendations for calories, protein, iron, calcium and vitamin A, and it is difficult to understand that exception to this liberality should be taken only in the case of thiamine, riboflavin and ascorbic acid. It long has been established that very many adult persons can subsist in quite good health on less than half the amount of protein recommended. There also is much evidence that calories can be lowered to 2,200 or less with a minimum of inconvenience for many normal adult males; yet no scientist has suggested that this would be desirable.

The objections to the allowances for thiamine and ascorbic acid also fail to recognize that these two nutrients, being highly labile substances, are much

[3] United Nations Conference on Food and Agriculture, Hot Springs, Virginia, May 18 to June 3, 1943. Final Act and Section Reports. Washington: U. S. Government Printing Office, 1943.

[4] Italics ours.

[5] Joint Committee, Combined Food Board, U. S. Dept. of Agriculture, War Food Administration. Washington: U. S. Government Printing Office, April, 1944.

more easily lost to the consumer than any other of the nutrients mentioned in the Table of Recommended Dietary Allowances. The factor of safety applied to thiamine was less than that applied to several other nutrients. It was not supposed to cover cooking losses; yet it does so serve to some extent for that part of the population with requirements which are less than average. Losses from cooking in the case of thiamine and ascorbic acid are far greater than is the case with the other nutrients named in the table. Also loss after eating but before absorption is a factor to be reckoned with and can be expected to be greater in the case of thiamine and ascorbic acid than with the other nutrients. In other words, the need for a factor of safety for thiamine and ascorbic acid is greater than for any other nutrient in the table.

The objections of some scientific workers to the levels set for thiamine, riboflavin and ascorbic acid are based on recent evidence of minimal requirements. This evidence, although representing carefully conducted investigation, all relates to small groups of experimental subjects studied for periods—at the longest six to nine months—representing no more than 1 per cent. of the life span of the human species. Other studies with other subjects point to higher minimal requirements. Also much investigation with lower animals has shown that allowances which seem to be quite adequate to provide for health and vigor for short periods of the life span are quite inadequate to maintain good health for the life span as a whole. Furthermore, good nutrition must demand that the individual shall possess stores of nutrients as reserves to meet emergencies. There has been dispute about whether evidence of diminishing reserves is acceptable as a criterion of requirements. Be that as it may be, the fact remains that persons who possess reserves are better able to withstand not only temporary deprivations but also stresses such as are involved in surgical operations or disease than persons who lack reserves. This has long been well established for protein and iron, and evidence is now at hand that it applies as well, possibly even more acutely, to reserves of vitamins, and especially to the body's store of thiamine, which is relatively rapidly depleted when the intake falls below requirements.

On the other hand, the recent evidence suggests that requirements for thiamine and riboflavin are less closely related to the total calories of the diet or to total expenditure of energy than appeared to be the case when allowances for these vitamins were recommended. The present recommendations of 0.6 mg of thiamine and 0.9 mg of riboflavin for each 1,000 calories are readily defensible when the calorie intake is 2,500 or less. They are less defensible for higher calorie brackets. The great majority of diets for adult men and women provide not less than 2,000 nor more than 3,000 calories. Therefore, it is justifiable to consider setting a single allowance for thiamine (1.5 mg) and one for riboflavin (2.0 mg) for all normal adult men and women, with an accompanying suggestion that, when either the calorie value of the diet or the expenditure of energy is much more than 2,500 or 3,000 calories, additional thiamine and riboflavin may be necessary. A similar simplification may be desirable in the case of niacin.

Revision of the Table of Recommended Dietary Allowances is under consideration at the present time. As was the case before, the recommendations, when they are made, will represent so far as possible the consensus of informed opinion as to the amounts justified by available evidence respecting the range of requirements of normal persons.

PLANT BREEDING IN RELATION TO HUMAN NUTRITION[1]

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A PROMINENT economist[2] has stated recently that after ten years in which to reorganize its agriculture and to readjust its consumption, this nation could feed twice its present population at a higher level of health and of working efficiency than under present conditions. Here is a challenging statement to all agriculturists, regardless of whether they consider the establishment of such a goal as feasible or, perhaps, in one of its implications, even desirable. There can be no serious dissent from the idea of maintaining a level of human nutrition that assures health and working efficiency, but for the continued development of a higher order of civilization it is not unlikely that population should level off at a place well below the complete utilization for food of all that could be produced efficiently.

All available evidence indicates that man lived for a few million years as a savage when practically all his energies, aside from those required from time to time in fighting enemies, were expended in acquiring food and shelter. These he took more or less as nature had provided them or as he could prepare them by primitive means ready at hand. From this plane of

[1] Address of the vice-president and chairman of the Section on Agriculture (O) of the American Association for the Advancement of Science, Cleveland, Ohio, September, 1944.

[2] Jno. D. Black, "Food Enough." The Jaques Cattell Press. 1943.