Diet

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What is Known of Human Nutritional Needs

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I have seldom been faced with a more formidable challenge than to give a short review of this topic. The field is immense, the literature overwhelming, public interest is intense, and demands to "do something" of such magnitude that all segments of society that deal with food -- which means everyone -- are involved.

In the simplest terms we are talking about the requirement of the human machine for fuel -- partly an energy problem. Unfortunately man cannot utilize coal or petroleum or solar energy directly but depends instead on plants and on animals that also utilize plants. The chemistry and biochemistry involved in the nutrition of animals (including man) have become understandable only in the last few decades. Primarily we need proteins, fats, and carbohydrates and in smaller amounts vitamins and minerals. But these categories can be broken down to 50 or 60 separate items necessary for optimal nutrition. We do not know what "optimal" means for man. Choices are: fast growing, athletic ability, resistance to disease and toxins, mental health, and longevity, all reasonable goals but we simply do not know whether they require the same relative nutrient intakes.

Table I lists the recommended daily allowances (RDA) for some nutrients about which most nutritionists agree. These tentative recommendations, as of 1974, were revised from a previous list, published in 1968, and are again being revised for release in 1979. Individuals require differing amounts of nutrients as they mature from infant to childhood, through puberty, to adulthood and old age; pregnancy and lactation demand changes. In addition

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the requirements will vary with size, and, in amounts not yet understood, with considerable variability from individual to individual. The RDAs are for healthy individuals. Groups suffering from various ills have different requirements. Hence the table can be used for the barest approximation, especially as we continue to learn that there may be additional factors not yet identified. The listing of required nutrients have led some to the thought that if a little is good more will be better so we must consider both the upper and lower limits for each amount. Some vitamins, for example A and D, and many minerals are damaging if injested in large amounts. Harm could result if several different kinds of foods are fortified and consumed.

Thus we see that a general outline of what humans require is available and we know within limits the amounts of each nutrient needed. However we eat food not nutrients and our concepts are colored by the acceptability of the food available. Food technologists are sometimes criticized for paying more attention to color, flavor and texture than to nutritional content but, in the long run, unless the food is consumed it does not matter what nutrients it contains. All of us are or should be working toward the provision of attractive foodstuffs with optimal nutrient content. The science of food technology is advancing rapidly and these goals can be accomplished if the impetus is strong enough.

One method of stimulating changes in the nature of the food intake has been the actions of the Senate Committee on Nutrition and Human Needs chaired by Senator McGovern. Numerous hearings resulted in the dietary goals shown in Table II. There was no unanimity of opinion regarding the wisdom of trying to change the American diet as proposed in the first version and the second was drawn up in response to criticisms of the first. They suggest roughly: cut

down on calories, meat, fat, sugar, and salt, increase chickens and fish, cereals, and fruits and vegetables. Details are still being argued vociferously. I may predict, after the smoke has cleared, that our diet will not have changed much. We are creatures of habit and eating is a part of living that plays a considerably greater role than the ingestion of nutrients.

Finally in Table III I have listed some controversial topics which are currently in the public eye. There are strong differences of opinion among experts in some of these matters. It is an uncomfortable situation when the public is exposed to widely disparate points-of-view. For example we do not have agreed-upon answers as to whether large doses of ascorbic acid are beneficial for preventing or treating colds and cancer. We cannot reach a concensus as to whether the use of vitamin pills is a helpful nutrition concept. Most agree that the average individual who is consuming a mixed diet of meat, milk, cereals, fruits and vegetables does not need additional vitamins. But if a person takes vitamin pills and feels better, even though the so-called "placebo effect" may be responsible, there seems to be no firm reason why he should not continue. Similarly with many of the other controversial topics.

In summary, the most obvious nutritional difficulty in this country is obesity. This can be handled by careful control of calorie intake and by exercise. Evidence is available that certain elements of our population may have low iron or vitamin A intakes but very little else in the way of deficiences. On the other hand if nutritional inadequacies are playing an important role in heart disease (arguable) or cancer (arguable), we ought at least learn as much as we can about these possibilities. Guideposts should be available.

In most of the rest of the world the most obvious nutritional difficulty is hunger but that is an entirely different story.

References

1. Recommended Dietary Allowances, 8th Ed., 1974, Committee on Interpretation of the Recommended Dietary Allowances, Food and Nutrition Board, National Research Council, National Academy of Sciences, Washington, D.C.

2. Dietary Goals for the United States, First Edition, February, 1977. Select Committee on Nutrition and Human Needs. United States Senate, U.S. Government Printing Office, Washington, D.C.

3. Dietary Goals for the United States, Second Edition, December, 1977. Select Committee on Nutrition and Human Needs. United States Senate, U.S. Government Printing Office, Washington, D.C.

Table 1

FOOD AND NUTRITION BOARD, NATIONAL ACADEMY OF SCIENCES-NATIONAL RESEARCH COUNCIL
RECOMMENDED DAILY DIETARY ALLOWANCES,[a] Revised 1974

Designed for the maintenance of good nutrition of practically all healthy people in the U.S.A.

	Age	Weight		Height		Energy	Protein	Fat-Soluble Vitamins				Water-Soluble Vitamins							Minerals					
								Vitamin A Activity		Vitamin D	Vitamin E Activity[c]	Ascorbic Acid	Folacin[f]	Niacin[g]	Riboflavin	Thiamin	Vitamin B_6	Vitamin B_{12}	Calcium	Phosphorus	Iodine	Iron	Magnesium	Zinc
	(years)	(kg)	(lbs)	(cm)	(in)	(kcal)[b]	(g)	(RE)[c]	(IU)	(IU)	(IU)	(mg)	(μg)	(mg)	(mg)	(mg)	(mg)	(μg)	(mg)	(mg)	(μg)	(mg)	(mg)	(mg)
Infants	0.0–0.5	6	14	60	24	kg × 117	kg × 2.2	420[d]	1,400	400	4	35	50	5	0.4	0.3	0.3	0.3	360	240	35	10	60	3
	0.5–1.0	9	20	71	28	kg × 108	kg × 2.0	400	2,000	400	5	35	50	8	0.6	0.5	0.4	0.3	540	400	45	15	70	5
Children	1–3	13	28	86	34	1,300	23	400	2,000	400	7	40	100	9	0.8	0.7	0.6	1.0	800	800	60	15	150	10
	4–6	20	44	110	44	1,800	30	500	2,500	400	9	40	200	12	1.1	0.9	0.9	1.5	800	800	80	10	200	10
	7–10	30	66	135	54	2,400	36	700	3,300	400	10	40	300	16	1.2	1.2	1.2	2.0	800	800	110	10	250	10
Males	11–14	44	97	158	63	2,800	44	1,000	5,000	400	12	45	400	18	1.5	1.4	1.6	3.0	1,200	1,200	130	18	350	15
	15–18	61	134	172	69	3,000	54	1,000	5,000	400	15	45	400	20	1.8	1.5	2.0	3.0	1,200	1,200	150	18	400	15
	19–22	67	147	172	69	3,000	54	1,000	5,000	400	15	45	400	20	1.8	1.5	2.0	3.0	800	800	140	10	350	15
	23–50	70	154	172	69	2,700	56	1,000	5,000		15	45	400	18	1.6	1.4	2.0	3.0	800	800	130	10	350	15
	51+	70	154	172	69	2,400	56	1,000	5,000		15	45	400	16	1.5	1.2	2.0	3.0	800	800	110	10	350	15
Females	11–14	44	97	155	62	2,400	44	800	4,000	400	12	45	400	16	1.3	1.2	1.6	3.0	1,200	1,200	115	18	300	15
	15–18	54	119	162	65	2,100	48	800	4,000	400	12	45	400	14	1.4	1.1	2.0	3.0	1,200	1,200	115	18	300	15
	19–22	58	128	162	65	2,100	46	800	4,000	400	12	45	400	14	1.4	1.1	2.0	3.0	800	800	100	18	300	15
	23–50	58	128	162	65	2,000	46	800	4,000		12	45	400	13	1.2	1.0	2.0	3.0	800	800	100	18	300	15
	51+	58	128	162	65	1,800	46	800	4,000		12	45	400	12	1.1	1.0	2.0	3.0	800	800	80	10	300	15
Pregnant						+300	+30	1,000	5,000	400	15	60	800	+2	+0.3	+0.3	2.5	4.0	1,200	1,200	125	18+[h]	450	20
Lactating						+500	+20	1,200	6,000	400	15	80	600	+4	+0.5	+0.3	2.5	4.0	1,200	1,200	150	18	450	25

[a] The allowances are intended to provide for individual variations among most normal persons as they live in the United States under usual environmental stresses. Diets should be based on a variety of common foods in order to provide other nutrients for which human requirements have been less well defined. See text for more detailed discussion of allowances and of nutrients not tabulated. See Table I (p. 6) for weights and heights by individual year of age.

[b] Kilojoules (kJ) = 4.2 × kcal.

[c] Retinol equivalents.

[d] Assumed to be all as retinol in milk during the first six months of life. All subsequent intakes are assumed to be half as retinol and half as β-carotene when calculated from international units. As retinol equivalents, three fourths are as retinol and one fourth as β-carotene.

[e] Total vitamin E activity, estimated to be 80 percent as α-tocopherol and 20 percent other tocopherols. See text for variation in allowances.

[f] The folacin allowances refer to dietary sources as determined by *Lactobacillus casei* assay. Pure forms of folacin may be effective in doses less than one fourth of the recommended dietary allowance.

[g] Although allowances are expressed as niacin, it is recognized that on the average 1 mg of niacin is derived from each 60 mg of dietary tryptophan.

[h] This increased requirement cannot be met by ordinary diets; therefore, the use of supplemental iron is recommended.

TABLE II. Dietary Goals for the U.S. Select Senate Committee on Nutrition and Human Needs.

	First Edition (Feb. 1977)	Second Edition (Dec. 1977)
Energy	Nothing	Control calorie intake
Carbohydrate	Increase to 55-60% calories	Increase from 28% to 40% calories
Sugar	Reduce by 40% to 15% of calories	Reduce by 40% to 15% of calories
Fat	Reduce by 40% to 30% of calories	Reduce by 40% to 30% of calories
Saturated fat	Reduce from 16% to 10% of calories	Reduce from 16% to 10% of calories
Cholesterol	Limit to 300 mg/day	Limit to 300 mg/day
Salt	Limit to 3g/day	Limit to 5g/day

TABLE III. Controversial Topics

Diet Fads	Natural Toxins
Megavitamins	Mercury
Food Additives	Saccharin
-purposeful (GRAS)	Caffeine
-adventitious	Fiber
Delaney Clause	Sugar