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THE RDAS: THE PARTY LINE AND BEYOND

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INTRODUCTION

Dietary assessment is not new. The earliest medical writings confirm that estimates of eating habits, albeit recorded in primitive style, have been around for a long time. Even in this day and age of technologic wonders, the dietary diary constitutes the most common method of measuring food and drink intake. True, there have been refinements. We now can look at approximately 40 different nutrients in seven, four, three or one-day records tallied through computerized food frequency questionnaires. Also, there are now more elaborate food composition tables that provide the number of milligrams of vitamin X or micrograms of mineral Y in each serving of almost any food. Nevertheless, the appraisal of what one eats or drinks is still relatively crude. For more particulars regarding current methodology and philosophy of dietary assessments, look to the work of Dr. James Levine and his colleague at the Academic Department of Medicine, the Royal Free Hospital and School of Medicine in London (1).

The most complete current evaluation is possible by placing a subject in a metabolic chamber and measuring intake and output under hi-tech (unfortunately expensive) conditions. Most importantly, however, it is not how many milligrams of this or micrograms of that we ingest, but what does it all mean in terms of the adequacy of our diet? The bottom line is, "Are our eating habits inviting health or sickness?"

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IN THE BEGINNING

With increasing interest in diet/nutrition and with the new information becoming increasingly available, the scientific community began to make attempts in the late 1930s to design recommendations for the major foodstuffs as well as the quantity of each vitamin and mineral necessary in the daily diet. The League of Nations, the predecessor of the United Nations, appointed a blue-ribbon committee to create a set of international standards. In fact, they actually were commissioned to define "the principles of nutrition best suited to ensure the fullest development and the maintenance of the organism." These standards were to become a factor in important decisions made in Britain following the outbreak of World War II in 1939.

The first edition (there are now nine revisions) of the U.S. Recommended Dietary Allowances (RDAs) was published in 1943 during World War II with the objective of "providing standards to serve as a goal for good nutrition." In subsequent editions, the point was made that:

> ...The recommendations are not requirements, since they represent, not merely minimal needs of average persons, but nutrient levels selected to cover individual variations in a substantial majority of the population and ... to provide the increased needs in times of stress...

In the last edition (Tenth) (2), the RDAs are defined as follows:

> ...The levels of intake of essential nutrients that, on the basis of scientific knowledge, are judged by the Food and Nutrition Board to be adequate to meet the

known nutrient needs of practically all healthy persons...

In plain and simple language, it should be emphasized that the RDAs are intended to satisfy the health needs of healthy individuals. The sticky point is that nowhere in the Tenth Revised Edition is health defined! The critical issue for now is that the RDAs will differ with different definitions of health.

THE NOW AND NEW RDAS

The most recent dietary recommendations grant that there are approximately 50 known nutrients. Generally speaking, precise requirements are provided for some. In other instances, the suggested intakes are more general. Finally, there are several with no pronouncements. In the interest of expedition, we shall examine only a few representative nutrients. It is our hope that, from these examples, we can arrive at reasonable generalizations.

Vitamin C: The Subcommittee has offered few changes from its last suggestions in 1985. It proposes that 60 mg daily continue to be the accepted recommendation, for both adult male and female. How possible is this to achieve? To satisfy the current 60 mg per day vitamin C requirement means eating approximately three servings of fresh vegetables and two fresh fruits daily. According to the best available evidence today from the National Institutes of Health, only 9% of Americans take in enough vitamin C (3). The single official change in the recommendation is that, "Regular smokers ingest at least 100 mg of vitamin C daily."

Thus far, we have described the amount of ascorbic acid that will protect us against the worst and classical deficiency symptom, scurvy.

AND NOW... BEYOND THE TRADITIONAL RDAS.

Emil Ginter from the Research Institute of Human Nutrition in the former Czechoslovakia (4) raises the interesting point, "Ideal RDA should be based on studies with increasing vitamin C doses in which the efficiency of the ascorbate dependent systems would be correlated with the vitamin C concentration in the target tissues..." In other words, how much vitamin C is necessary to maintain benefits such as the desirable serum cholesterol concentration? In his own words, "It is probable that in healthy adults (still-to-be-defined), such a dose ranges from 100 to 200 mg, and that in stress conditions it exceeds 200 mg per day." Here is a challenge to the party line.

Table 1. The desired vitamin C intake

Line		Sample Size	CMI Range	CMI Mean	Vitamin C (mg) Range	Vitamin C (mg) Mean
1	Entire Sample	1038	0 - 125	16	15 - 1120	327
2	CMI < 30	912	0 - 29	12	41 - 1120	335
3	CMI < 15	581	0 - 14	8	41 - 1120	349
4	CMI < 5	113	0 - 4	3	49 - 1120	376
5	CMI < 4	73	0 - 3	2	104 - 736	383
6	CMI < 3	46	0 - 2	2	108 - 736	389
7	CMI < 2	16	0 - 1	1	116 - 719	390
8	CMI = 0	6	0	0	20 - 719	410

There is still another and more innovative way of ascertaining the amount of vitamin C necessary to maintain health in healthy subjects. At the University Medical Center in Birmingham, our group became involved a number of years ago in evaluating the health of health care providers. The daily vitamin C consumption for 1038 dentists and their spouses was calculated using (admittedly crude) food frequency questionnaires. This questionnaire assessed the amount of vitamin C consumed from both diet and ascorbic acid or multivitamin supplementation. Clinical state was graded by the Cornell Medical Index Health Questionnaire (CMI), a form consisting of 195 self-administered questions. Each query is answered by circling the word "yes" or "no." Every interrogative is phrased so that the affirmative answers indicate possible pathology. The clinical findings in this report are the total number of positive CMI responses (score).

Line 1 of **Table 1** shows the daily vitamin C consumption of the entire group of doctors and their spouses. In this sample of 1038, the CMI ranged from 0 to 125 with a mean of 16. The daily reported vitamin C intake spread from 15 to 1120 mg. Think if it! There are allegedly healthy doctors consuming only 25% (15 mg) of the RDA! The average ascorbic acid was 327 mg per day, which, incidentally, is five or six-fold more than the RDA.

Parenthetic mention should be made that both the American Medical Association (AMA) and the American Dental Association (ADA) have indicated that the type of doctor interested in his own health (and willing to be studied as in this survey) is already above average in health. Hence, in the usual context, these values should be viewed as closer to ideal when, in fact, they are only normal (average).

Proceeding through the chart (lines 2-8), the daily vitamin C intake slowly and progressively rises as the number of clinical symptoms (CMI scores) is reduced. This approach indicates that the clinically healthier the sample, the greater the daily vitamin C intake. Under the conditions of this experiment, approximately 410 mg of vitamin C seems to be necessary for healthy people who wish to maintain health. It is about seven times the RDA!

There is a mind boggling addendum (6). We discovered that two prominent paleontologists, Eaton and Konner from Atlanta (7), in their magnificent and monumental report, outline the diet

Table 2. Relationship of reported daily vitamin A consumption (food frequency questionnaire) and reported total clinical findings (Cornell Medical Index Health Questionnaire) in a presumably healthy male and female sample

Line		Sample Size	Clinical Findings (Affirmative CMI Responses) Range	Mean	Daily Intake of Vitamin A (IU) Range	Mean
1	Entire Sample	1056	0 - 125	16	1000 - 98209	19096
2	CMI < 30	928	0 - 29	12	1000 - 98209	19368
3	CMI < 10	379	0 - 9	6	1000 - 98209	20448
4	CMI < 5	116	0 - 4	3	1000 - 68889	22463
5	CMI < 4	75	0 - 3	2	5200 - 63688	23595
6	CMI < 3	46	0 - 2	2	5702 - 63688	24299
7	CMI < 2	17	0 - 1	1	8646 - 43000	26043
8	CMI = 0	6	0	0	18748 - 48908	32529

of our remote ancestors as a reference standard for modern human nutrition and as a model for defense against certain so-called diseases of civilization. *Apropos* vitamin C, they estimate from the mean ascorbic acid content of 27 vegetables consumed by hunter-gatherers that the average vitamin C intake would have been 392.3 mg per day in paleolithic diets. Eaton and Konner (from their sophisticated and elaborate study of primitive man) came up with 392 mg; from our investigation of the modern human, we find 410 mg...a matter of 4% difference!

These observations have led us to what we now come to call the Optimal Recommended Dietary Allowances (ORDAs). Interestingly, others (8) have also picked up on this buzzword, proposing the term Optimal Dietary Allowances (ODAs).

Other water-soluble vitamins have been studied (9, 10). The RDA/ORDA relationships follow those just-described for the ascorbates, namely that the more desired intake is five to ten times the RDA.

Vitamin A: Let us now turn our attention to a fat soluble essential nutrient. The adult RDA for vitamin A has been set at 1000 retinol equivalents or 5000 IU for the male and 800 retinol equivalents (4000 IU) for the female. The Food and Nutrition Board states that the RDA has been estimated from a combination of dark adaptation (visual) studies and blood values, and by extrapolation from lower animal studies. There is no claim that this dosage is intended as the perfect daily intake for the maintenance of overall general health.

Utilizing the symptomless and signfree approach earlier described for vitamin C, **Table 2** summarizes the results for vitamin A (11). In this sample, the daily range for vitamin A was 1000 to 98209 IU (line 1) with an average of 19096. It is approximately fourfold the amount designated as the RDA and also four times higher than the average daily vitamin A intake for Americans (4731 IU). The reason is that many of these subjects supplemented their diet daily with vitamin A rich preparations. Proceeding through the Table (lines 2-8), it is obvious that progressively fewer symptoms and signs are associated with an increasing vitamin intake. Under the conditions of this experiment, approximately 33000 IU of vitamin A may be designated as the ORDA, a matter of sevenfold greater than the RDA.

It is now recognized that beta carotene is a precursor of vitamin A. While no specific recommendation is made for these carotenoids, the Tenth Revised Edition of the RDA suggests a vitamin A/beta carotene ratio of 1:2.

Earlier mention was made of Ginter and his revised (higher) RDA for vitamin C based on serum cholesterol. Our laboratory has considered the connection between vitamin E and serum cholesterol (12). Three hundred and sixty doctors and their spouses were studied. The subjects were divided into three groups, 120 under the age of forty, 120 in their forties, and 120 over forty. The group was further categorized into those consuming less than 100 IU of vitamin E daily (average 22 IU) and those ingesting on a daily basis 100+ IU (average 158 IU). Clearly, as is well-known and confirmed (**Figure 1**), serum cholesterol ordinarily rises with advancing age. However, we learn here that the rate at which serum cholesterol advances is significantly different based upon the daily vitamin E consumption. In the group consuming, on the average, 22 IU which is very close to what is presently suggested as the RDA, the climb in serum cholesterol is much greater than in those ingesting approximately sixfold the RDA (average 158 IU). In fact, the 56-year old person taking six times the RDA has a serum cholesterol of 226 mg%; the 34-year old with the daily RDA shows a cholesterol of 231 mg%. Hence, the 56-year old, taking vitamin E is, in fact, going on 34 years of age!

Others have looked specifically at vitamin E and heart disease. In a study of 127,000 people (13, 14), participants who took vitamin E

supplements for at least two years had about a 40% lower risk of heart disease than those who received their vitamin E through diet alone. Supplementation started at 100 IU and went higher.

Within the limits of these few observations, there is a consistent RDA/ORDA pattern for the fat-soluble vitamins not unlike that earlier reported for the water-soluble group.

Minerals: The Food and Nutrition Board has now assigned reasonably specific recommendations for certain minerals. A case in point is iodine. The current adult RDA for both genders is 150 mcg. We have examined this problem employing our already-mentioned symptomless and signfree analysis (15). **Table 3** (line 1) shows the daily iodine consumption of the entire group of doctors and their spouses. The intake ranged from 100 to 4500 mcg with a mean of 500. This is approximately threefold the amount designated as the RDA. As one builds the progressively healthier group (lines 2 to 8), we note the daily iodine slowly rises. This study suggests that the ORDA might well be approximately 1100 mcg per day which is roughly seven times the RDA.

We have also analyzed the possibility of finding an ORDA for magnesium (16). The pattern is very similar. The major difference is that the ORDA appears to be only 15 to 34% higher than the current recommendation.

Others have looked at calcium intake and concluded that the current RDA should be increased by 50 to 100%. One such study dealt with elderly women and the reduction of hip fractures (17). Another double-blind study of identical twins showed that in prepubertal children, calcium supplementation increased bone density (18).

Figure 1 The relationship of daily relatively low (<100 IU, mean 22) and high (100+ IU, mean 158) vitamin E consumption versus nonfasting serum cholesterol. In both groups, serum cholesterol rises with advancing age. However, in the group characterized by a daily vitamin E consistent with the RDA, the serum cholesterol is higher than in the group of subjects consuming approximately sevenfold the RDA.

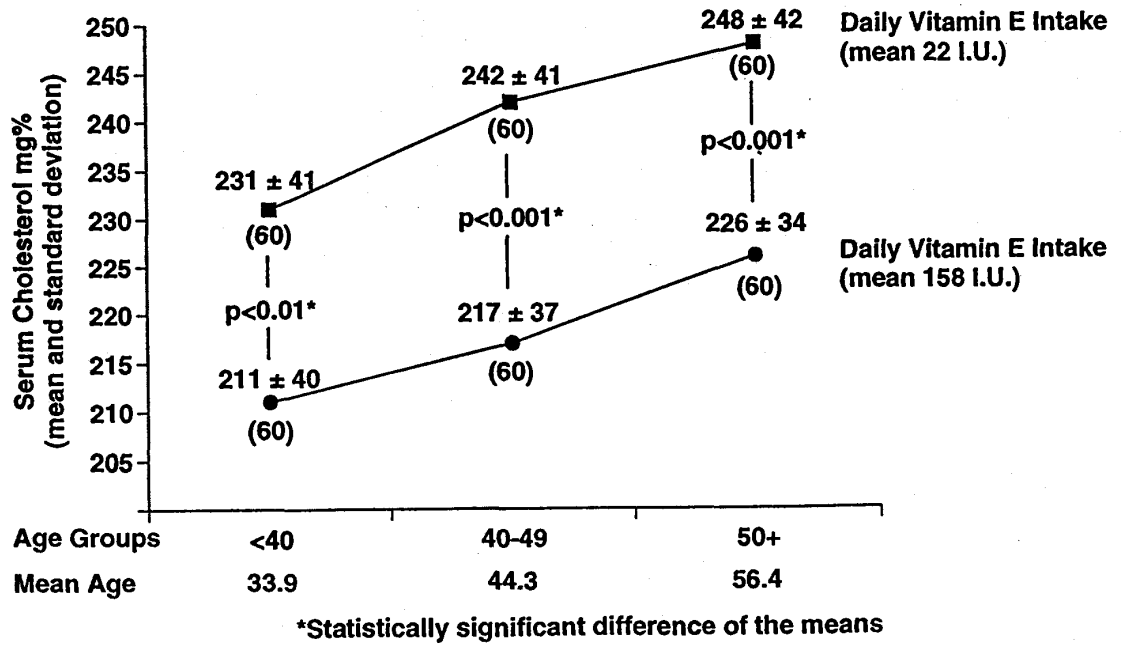

Table 3. Relationship of reported daily iodine consumption (seven-day dietary survey) and reported total clinical findings (Cornell Medical Index Health Questionnaire) in a presumably healthy male and female sample

Line		Sample Size	Clinical Findings (Affirmative CMI Responses) Range	Mean	Daily Intake of Iodine (mcg) Range	Mean
1	Entire Sample	1010	0 - 125	16	100 - 4500	500
2	CMI < 30	892	0 - 29	13	200 - 4500	500
3	CMI < 10	355	0 - 9	6	200 - 3800	600
4	CMI < 5	108	0 - 4	3	200 - 2000	600
5	CMI < 4	69	0 - 3	2	200 - 2000	600
6	CMI < 3	45	0 - 2	2	200 - 2000	700
7	CMI < 2	14	0 - 1	1	200 - 2000	800
8	CMI = 0	5	0	0	700 - 2000	1100

Protein: In 1985, WHO restudied protein requirements. From short and long studies in healthy young individuals and by means of statistical manipulation, it is now concluded that 0.75 g/kg per day is the recommended allowance of protein for healthy young individuals irrespective of gender.

Table 4 (line 1) shows the daily total protein consumption of the entire group of doctors and their spouses (19). Two points should be emphasized. First, as a group, protein consumption exceeds the current RDA. Secondly, as one develops an ORDA, the recommendations for total protein is approximately two and one half times the RDA.

There are, of course, a number of essential and nonessential amino acids. The Food and Nutrition Board has not set specific recommen-

Table 4. Relationship of reported daily protein intake and reported total clinical findings in a presumably healthy male and female sample

Line		Sample Size	Clinical Findings (Affirmative CMI Responses) Range	Mean	Daily Intake of Total Protein (g) Range	Mean
1	Entire Sample	1040	0 - 125	16	25 - 257	103
2	CMI < 30	915	0 - 29	12	25 - 257	102
3	CMI < 10	369	0 - 9	6	38 - 240	108
4	CMI < 5	108	0 - 4	3	41 - 240	111
5	CMI < 4	71	0 - 3	2	57 - 196	111
6	CMI < 3	42	0 - 2	2	70 - 196	113
7	CMI < 2	14	0 - 1	1	70 - 163	112
8	CMI = 0	6	0	0	100 - 163	125

dations. However, they have published estimated human requirements (12 mg per kilogram of body weight per day) for lysine. **Table 5** (line 1) shows the Alabama study of the daily lysine consumption for a group of 859 doctors and their spouses (20). The reported intake for the group ranged from 1100 to 17596 with an average of 6940 mg/day. This is approximately eightfold the amount designated by the Food and Nutrition Board. Utilizing the optimal model described earlier, under the conditions of this experiment, the suggested allowance may well be tenfold that proposed by the National Research Council.

The patterns for other essential amino acids are very similar (21).

Carbohydrates: According to the Food and Nutrition Board, there are insufficient data to establish the RDA for carbohydrates. They recognize it as a major source of food energy and call attention to research indicating that at least 100 g of carbohydrates per day appears to be needed to avoid ketosis, excessive protein breakdown, or other undesirable metabolic responses. Apparently, the Food and Nutrition Board is not concerned with the nutritional value or the effect on the body of different types or amounts of carbohydrates. The fact of the matter is: *refined and unrefined carbohydrate calories exert different metabolic effects.*

Employing the model for optimality, **Table 6** describes the possible desired daily intake of refined carbohydrate foodstuffs (22). Of all the nutrients studied thus far, this is the first incidence where, as one develops healthiness, the amount of the foodstuff decreases. Under these conditions, there is presumptive evidence to suggest that, very likely, the optimal daily refined carbohydrate consumption should approach zero. An analysis of unrefined carbohydrates (23) makes the point that the healthier the subject, the greater the complex carbohydrate consumption. In other words, the refined and unrefined carbohydrates are inversely related!

A LOOK INTO THE FUTURE

Finally, the Food and Nutrition Board of the National Research Council has indicated its present position in other areas:

> ...Natural foods contain many compounds that have no known nutritional effects. These include the flavonoids, rutin, quercetin, and hesperidin—the so-called vitamin P factors ... (2)

Table 5. Relationship of reported daily lysine consumption and reported total clinical findings in a presumably healthy male and female sample

Line		Sample Size	Clinical Findings (Affirmative CMI Responses) Range	Mean	Daily Intake of Lysine (mg) Range	Mean
1	Entire Sample	859	0 - 125	16	1100 - 17596	6940
2	CMI < 30	762	0 - 29	12	1100 - 17596	6932
3	CMI < 10	318	0 - 9	6	2700 - 17596	7310
4	CMI < 5	103	0 - 4	3	2731 - 13689	7533
5	CMI < 4	69	0 - 3	2	3300 - 13689	7617
6	CMI < 3	42	0 - 2	2	4025 - 13689	7708
7	CMI < 2	15	0 - 1	1	4025 - 13527	8108
8	CMI = 0	5	0	0	7000 - 13527	9411

Actually, there is a wealth of information about the bioflavonoids. For example, an entire chapter in my latest book (24) has been devoted to many exciting functions for these cofactors, such as sports injuries, vasomotor manifestations of the menopause, and canker sores.

SUMMARY AND CONCLUSIONS

The need for evaluating and ultimately deriving dietary recommendations is without contest.

> ...RDAs are defined as the levels of intake of essential nutrients that, on the basis of scientific knowledge, are judged by the Food and Nutrition Board to be adequate to meet the known nutrient needs of practically all healthy persons. This definition has remained essentially unchanged since 1974 (eighth edition). Individuals with special nutritional needs are not covered by the RDAs (2)

The burning question is "Who are the individuals with special needs?" The Food and Nutrition Board now for the first time agrees that smokers have a "special need" for more vitamin C. Will they next confer special requirements on contraceptive pill takers, laxative users, and those ingesting alcohol and antibiotics? The Committee grants that pregnant and lactating women have special requirements. Surely, the aged and the infirm are also exceptional cases. Hence, there is a need for something beyond the RDAs. These have been referred to in this report as the ORDAs. Speaking generally, vitamin, mineral, protein and amino acid intake should be significantly greater than the RDAs. There is now a general trend in this direction (25). The one glaring exception is the refined carbohydrate foodstuffs which, as has been demonstrated, are inversely related to health.

Finally, we need now to look at the "Ideal" Recommended Dietary Allowances (IRDAs). While these numbers will probably never be attained, as we sharpen our definition of health, surely we can go beyond the RDAs and even the ORDAs in this metaphysical realm. For example, diet/nutritional discussions generally center about *what* to eat. Seldom is there mention of *when* and *how* (*i.e.* nibbling versus gorging) (26). The existence of broad nutrient differences based on organ function is emphasized in a recent editorial (27). In the final analysis, we all seek to understand the role that food and drink plays in our personal search for optimum health, but we

Table 6. Relationship of reported daily refined carbohydrate consumption and reported total clinical findings in a presumably healthy male and female sample

Line		Sample Size	Clinical Findings (Affirmative CMI Responses) Range	Mean	Daily Intake of Refined Carbohydrates (g) Range	Mean
1	Entire Sample	1087	0 - 125	16	0 - 223	66
2	CMI < 30	949	0 - 29	13	0 - 223	65
3	CMI < 10	377	0 - 9	6	0 - 209	62
4	CMI < 5	119	0 - 4	3	1 - 120	58
5	CMI < 4	74	0 - 3	2	1 - 107	55
6	CMI < 3	49	0 - 2	2	1 - 105	52
7	CMI < 2	14	0 - 1	1	1 - 105	44
8	CMI < 1	5	0	0	2 - 58	35

must go beyond the current RDAs for assistance in this search.

REFERENCES

1. Levine JA and Morgan MY, Assessment of Dietary Intake in Man: A Review of Available Methods. *Journal of Nutritional Medicine* 2:1, 65-81, 1991
2. Food and Nutritional Board/Commission on Life Sciences/ National Research Council. *Recommended Dietary Allowances, 10th Edition*. 1989. Washington, DC, National Academy Press
3. Patterson BH, Block G, Rosenberger WJ, Pee D, and Dable, LL. Fruit and Vegetables in the American Diet: Data from the NHANES II Survey *American Journal of Public Health* 80:12, 1443-1449, December 1990
4. Ginter E. Ascorbic Acid in Cholesterol Metabolism and in Detoxification of Xenobiotic Substances: Problem of Optimum Vitamin C Intake. *Nutrition* 5:6, 369-374, November/December 1989
5. Cheraskin E, Ringsdorf WM Jr, and Medford FH. The "Ideal" Daily Vitamin C Intake *Journal of the Medical Association of the State of Alabama* 46:12, 37-40, June 1977
6. Cheraskin E. The "Ideal" Daily Vitamin C Intake. *Journal of Orthomolecular Medicine* 4:1, 241. Fourth Quarter 1986
7. Eaton SB and Konner M. Paleolithic Nutrition: A Consideration of its Nature and Current Implications. *New England Journal of Medicine* 312:5, 283-288, 31 January 1985
8. Lieberman S and Bruning N. *The Real Vitamin & Mineral Book: Going Beyond the RDA for Optimal Health.* 1990. Garden City Park, Avery Publishing Group, Inc.
9. Cheraskin E, Ringsdorf WM Jr, Medford FH, and Hicks BS. The "Ideal" Daily Niacin Intake. *International Journal for Vitamin and Nutrition Research* 46:1, 58-60, 1976.
10. Cheraskin E, Ringsdorf WM Jr, and Medford FH. The "Ideal" Daily Vitamin B_1 Intake. *Journal of Oral Medicine* 23:3, 77-79, July/September 1978
11. Cheraskin E, Ringsdorf WM Jr, and Medford FH. The "Ideal" Daily Vitamin A Intake. *International Journal for Vitamin and Nutrition Research* 46:1, 11-13, 1976
12. Cheraskin E. Unpublished data
13. Stamfer MJ, Hennekens CH, Manson JE, Colditz GA, Rosner B, and Willett WC. Vitamin E Consumption and the Risk of Coronary Disease in Women. *New England Journal of Medicine* 328:20, 1444-1449, 20 May 1993
14. Rimm EB, Stamfer MJ, Ascherio A, Giovannucci E, Colditz GA, and Willett WC. Vitamin E Consumption and the Risk of Coronary Heart Disease in Man. *New England Journal of Medicine* 328:20, 1450-1456, 20 May 1993
15. Ringsdorf WM Jr, Cheraskin E, and Medford FH. The "Ideal" Daily Human Iodine Requirement. *Journal of Orthomolecular Psychiatry* 9:2, 105-106, Second Quarter 1980
16. Cheraskin E, Ringsdorf WM Jr, and Medford FH. The "Ideal" Daily Magnesium Intake. *IRCS Medical Science* 5: 588, 1977
17. Chaput MC, Arlot ME, Duboeuf F, Brun J, Crouzet B, Arnaud S, Delmas PD, and Meunier PJ. Vitamin D_3 and Calcium to Prevent Hip Fractures in Elderly Women *New England Journal of Medicine* 327:23, 1637-1642, 3 December 1992
18. Johnston CC Jr, Miller JZ, Slemenda CW, Register TK, Hui S, Christian JC, and Peacock M. Calcium Supplementation and Increases in Bone Mineral Density in Children. *New England Journal of Medicine* 327:2, 82-87, 9 July 1992
19. Cheraskin E, Ringsdorf WM Jr, and Medford FH. The "Ideal" Daily Total Protein Intake. *Journal of the Medical Association of the State of Alabama* 47:5, 44-45, November 1977
20. Cheraskin E, Ringsdorf WM Jr, and Medford FH. The "Ideal" Daily Lysine Intake. *IRCS Medical Science* 5: 390, 1977
21. Cheraskin E, Ringsdorf WM Jr, and Medford FH. The "Ideal" Intake of Threonine, Valine, Phenylalanine, Leucine, Isoleucine, and Methionine. *Journal of Orthomolecular Psychiatry* 7:3, 150-155, Third Quarter 1978
22. Cheraskin E, and Ringsdorf WM Jr. How Much Refined Carbohydrate Should We Eat? *American Laboratory* 6:7, 31-35, July 1974
23. Cheraskin E, Ringsdorf WM Jr, Medford FH, and Hicks BS. The "Ideal" Unrefined Carbohydrate Intake. *Journal of the American Society of Preventive Dentistry* 7:1, 6-7, January-February 1977.
24. Cheraskin E. *Vitamin C...Who Needs It?*. 1993. Birmingham, Arlington Press.
25. Rath M. A New Era in Medicine. *Journal of Orthomolecular Medicine* 8:3, 134-135, Third Quarter 1993
26. Cheraskin E. The Breakfast/Lunch/Dinner Ritual. *Journal of Orthomolecular Medicine* 8:1, 6-10, First Quarter 1993
27. Heffley J. The Question of Adequacy. *Journal of Applied Nutrition* 45:2, 47, 1993