International Journal of Alternative and Complementary Medicine 12: #8, 29-31, August 1994

STUDY

The Nature/Nurture Debate: An Update

by E Cheraskin, MD, DMD

Introduction

Four items serve as an excellent prelude to and justification for this report on the role of genetics versus the environment in the genesis of health and sickness. Firstly, it is abundantly clear that the controversy exists. Two major medical mouthpieces, *Nature*[1-4] and the *New England Journal of Medicine*[5-6] continue to bring into focus the subject by means of important reports, editorials and letters. Secondly, the prevailing conclusion is that most major chronic diseases probably result from the accumulation of environmental factors over time in genetically susceptible persons. We are still currently unclear regarding the relative contributions of the environment and inheritance. It is essential to know the nature/nurture ratio. Obviously, the quotient would dictate the direction of subsequent research efforts and clinical pursuits. Thirdly, it is interesting that the present conclusions are based on conventional (and cumbersome) familial models including parents and children, twins, siblings, the orphaned and adopted. Finally, the least studied matrix, with the greatest possible contribution, is spouse-likeness., Clearly, married couples are rarely kin and obviously environmentally very close.

This report is intended to restudy the nature/nurture argument[7] through an examination of the simplest and least expensive familial prototype, the husband and wife. Interest in this particular model is further heightened by the recent observations[8] in undergraduate psychology students provided with separate male and female photographs of couples, freshly married and of long-standing. It is noteworthy that these inexperienced students, almost without exception, could not match newly married couples.

In contrast, they readily identified wedded couples of long-standing. This simple experiment demonstrates the old adage that spouses (and even their pets) begin to look alike with time. It also sharpens the role of the husband/wife relationship in the gene/environment argument.

Additionally, this is another in our series of essays on Medical Ignorance: *Myths and Magics in Modern Medicine*.

What We Know Today

Over the past three decades there has been an interest in the overall problem of spouse-likeness. Laced throughout the scientific literature for the past 50 years, with two notable exceptions, are approximately 50 reports generally confirming similarities in diverse patterns of married couples. For example, Winkelstein and Sackett[9-12] as well as others[13-23] have looked into the problem of family aggregation as it relates to hypertension. There has also been considerable interest by a number of investigators in carcinomatosis.[24-31]

The first of the two exceptions, Garn and his colleagues[32-49] have provided a series of consistent, structured and productive contributions extending over a period of approximately 20 years.

They have examined weight and weight change, urinary and blood vitamin studies (vitamins A and C, riboflavin, thiamine) serum cholesterol and triglycerides, dental caries, bone haemoglobin, hematocrit and diet (calories, calcium, protein, alcohol). It is safe to conclude that all of these parameters correlate significantly in husband/wife groups. In other words, with advancing time (length of cohabitation) these parameters become increasingly similar.

We, the other exception, here at the University of Alabama Medical Center, has also been studying familial, aggregation in a group of dental practitioners and their spouses. We have published approximatelv 20 papers over a period of 12 years.[50-69]

Experimental Design

The model we have employed for spousal similarities is shown in Table 1. Two hundred and sixty one couples were studied in terms of their serum cholesterol (line 1). These same dental practitioners' scores were compared to age and sex matched unrelated (line 2). Finally, the two female groups were compared (line 3). This format provided us with the opportunity of raising (and hopefully answering) three questions.

1. What is the relationship of serum cholesterol in married couples?
2. How does the husband-wife correlation compare with the pattern in the husband and an age-paired unrelated female?
3. Is the connection a function of time?

Line 1 shows a highly statistically significant correlation of serum cholesterol ($r=+0.361$, $p<0.01$). Hence, in answer to the first question, the evidence suggests that husbands and wives seem to demonstrate similar serum cholesterol levels.

In contrast, an examination of the men compared with the women age-paired against their wives (line 2) showed no such significant relationship ($r=0.075$, $p<0.05$). Therefore, with regard to the second query, there is no convincing correlation coefficient between serum cholesterol concentrations in men and women unrelated by marriage. This is heightened by the fact that the two women groups do show a remarkable similarity ($r=0.189$, $p<0.01$).

Table 1
Correlation coefficients for serum cholesterol

Line		number/ pairs	r	p
1	husband versus wife	261	+0.361	<0.01*
2	husband versus unrelated female	261	+0.075	<0.05
3	wife versus unrelated female	261	+0.189	<0.01*
	husband versus wife			
4	(husband's age <40)	107	+0.176	<0.05
5	(husband's age 40-49)	105	+0.279	<0.01*
6	(husband's age 50+)	49	+0.464	<0.01*
	husband versus unrelated female			
7	(husband's age <40)	107	+0.140	<0.05
8	(husband's age 40-49)	105	+0.040	<0.05
9	(husband's age 50+)	49	+0.075	<0.05
	wife versus unrelated female			
10	(husband's age <40)	107	+0.035	<0.05
11	(husband's age 40-49)	105	+0.023	<0.05
12	(husband's age 50+)	49	+0.048	<0.05

*statistically significant correlation coefficient

Finally, the question arises as to whether couples, consciously or otherwise, select each other on the basis of serum cholesterol. Lines 4, 5 and 6 show the correlation coefficients of the married groups in terms of advancing age. Line 4 pictures the men less than 40 years of age and their spouses. In this, the relatively youngest combination, there is so statistically significant correlation ($r=+0.176$, $p<0.05$).

In contrast, in the next age group (the men in the 40s), the relationship sharpens and becomes significant ($r=+0.464$, $p<.01$).

In answer to the third and final question, this clearly suggests that the combination is predominantly environmentally inspired.

The cholesterol model has been utilised in the study of all of the parameters listed in Table 2. In the interest of expedition and

clarification, it should be pointed out that, in several instances, a parameter was studied initially (line 2) in a small sample and subsequently re-examined (line 1) in a larger group. The initial report is identified as the preliminary document; the re-examination as the final report. This obtains in the case of SGOT (lines 6 and 13) and refined carbohydrates (lines 4 and 7).

Table 2
Correlation coefficients (in decreasing statistical order) for different parameters in married couples

line	parameter	r
1	enzymes/lactic dehydrogenase (LDH) final	+0.896**
2	enzymes/lactic dehydrogenase (LDH) preliminary	+0.892**
3	enzymes/creatine phosphokinase (CPK)	+0.762**
4	diet/refined carbohydrates/final	+0.547**
5	diet/total carbohydrates	+ 0.528**
6	clinical state/symptoms and signs/preliminary	+0.522**
7	diet/refined carbohydrates/preliminary	+0.520**
8	diet./fats	+0.484*
9	diet/vitamin A	+0.475**
10	blood/chemistry/serum cholesterol	+0.455**
11	diet/calories	+0.425**
12	blood chemistry/serum albumin	+0.387**
13	clinical state/symptoms and signs/final	+0.354**
14	enzymes/serum glutamic oxalacetic transaminase (SGOT) /final	+0.338** +0.338**
15	haematology/haemoglobin	+0.317**
16	diet/protein	+0.308**
17	clinical state/emotional problems	+0.286**
18	haematology/hematocrit	+0.252**
19	enzymes/serum glutamic oxalacetic transaminase (SGOT)/preliminary	+0.215
20	blood chemistry/blood glucose	+0.201**
21	enzymes/serum/slumatic pyruvic transaminase (SGPT)	+0.185*

** p<0.01
* p <0.05

Four points are worthy of emphasis. First, there is a considerable spread of correlation coefficients from a high of +0.896 (line 1) to a low of +.185 (line 21). Secondly, in all but one case (line 19), SGOT, the relationships are statistically impressive.At the present time, there is no explanation for the uniqueness of SGOT except that it might well be a problem in sample size. This is borne out by the lack of significance in the young group (Table 3, line 20) and the statistical consequence in the older group (*Table 4, line 5). Thirdly, the most significant correlations (and some are unbelievably high) occur in the enzyme groups (Tables 3 and 4, lines 1-3). Fourth, it is noteworthy that the results of the preliminary and final experiments are surprisingly constant. Lastly, it should be underlined that these findings were not viewed in the light of time of cohabitation.

Tables 3 and 4 are designed to emphasise the importance of time of marriage. Table 3 summarises the correlation coefficients for all of the studied parameters in the relatively younger groups. Three points become evident. First, there is a considerable spread of correlation coefficients from a high of +0.948 (line 1) for LDH to a low of -0.259 for blood glucose (line 21). Secondly, the majority of correlations are significant. This last point raises the interesting possibility that it might well be that partners do indeed tend to select themselves on the basis of some or all of these characteristics. On the other hand, it may be that couples begin to assume similar patterns early in marriage.

In contrast, Table 4 summarises the characteristics of relatively older married couples. We note, firstly, that there are many more significant correlations in older than younger couples. In point of fact, in this group there are all but two that show a statistical meaningfulness (lines 19 and 21). Secondly, in the main, the correlations sharpen as the groups get older. In other words, in more cases than not, the r is higher in the older than the younger. Thus, the overall evidence suggests that married couples, more often than not, become more similar with time of cohabitation.

Table 3

Correlation coefficients (in decreasing stastistical order) for different parameters in relatively younger married couples

line	parameter	r
1	enzymes/lactic dehydrogenase (LDH)/final	+0.948**
2	enzymes/lactic dehydrogenase (LDH)/preliminary	+0.937**
3	enzymes/creative phosphokinase (CPK)	+0.714**
4	diet/refined carbohydrates/final	+0.611**
5	diet/fat	+0.586**
6	diet/total carbohydrates	+0.473**
7	diet/refined carbohydrates/preliminary	+0.442**
8	diet/calories	+0.419**
9	blood chemistry/serum albumin	+0.401**
10	clinical state/symptoms and signs/preliminary	+0.373
11	enzymes/serum glutamic oxalacetic transminase (SHOT) final	+0.362**
12	diet/vitamin A	+0.328**
13	enzymes/serum glutamic pyruvic transaminase (SGPT)	+0.290*
14	hematology/hematrocrit	+0.288**
15	hematology/hemoglobin	+0.275**
16	diet/total protein	+0.271
17	clinical state/symptoms and signs/final	+0.264*
18	blood chemistry/serum cholesterol	+0.174
19	clinical state/emotional problems	+0.124
20	enzymes/serum glutamic oxalacetictransaminase (SGOT)/preliminary	-0.023
21	blood chemistry/blood glucose	-0.259

**p<0.01
*p<0.05

Table 4

Correlation coefficients (in decreasing statistical order) for different parameters in relatively older married couples

line	parameter	r
1	enzymes/lactic dehydrogenase (LDH)/preliminary	+0.877**
2	enzymes/lactic dehydrogenase (LDH)/final	+0.840**
3	enzymes/creatine phosphokinase (CPK)	+0.806**
4	Clinical state/symptoms and signs/preliminary	+0/689**
5	enzymes/serum glutamic oxalacetic transminase (SGOT)/preliminary	+0.686**
6	diet/refined carbohydrates/final	+0.670**
7	diet/refined carbohydrates/ preliminary	+0.669**
8	diet/total carbohydrates	+0.652**
9	diet/vitamin A	+0.636**
10	blood chemistry/serum cholesterol	+0.558**
11	clinical state/emotional problems	+0.502*
12	clinical state/symptoms and signs/final	+0.412*
13	blood chemistry/serum albumin	+0.365**
14	haematology/haemoglobin	+0.347**
15	diet/total protein	+0.343*
16	diet/calories	+0.336*
17	enzymes/serum glutamic oxalacetic transninase (SGOT)/final	+0.318**
18	blood chemistry/blood glucose	+0.315*
19	diet/fat	+0.223
20	haematololgy/haematocrit	+0.215*
21	enzymes/serum glutamic pyruvic transmaninase (SGPT)	+0.085

**p<0.01
*p<0.05

Comments

In general, the consensus seems to be as judged from the literature, that environmental factors play a very important role in spousal-likeness. The most consistent comparisons can be made from the work of Garn and his colleagues and Cheraskin and his

group. Both of these investigators, in some cases, studied the same or similar parameters. For example, this was surely the case with regard to diet. It is safe to conclude that the results are consistent. In other instances, Garn examines some characteristics not reported by Cheraskin and Cheraskin and his cohorts looked at areas not studied by Garn. Obviously, comparisons are not possible. However, the parameters still seem to follow predicted patterns. There is no question but that genetics play an important role (Chinese parents still seem to have Chinese children). However, within the limits of these studies, it would appear that the environment plays a cardinal (possibly even primary) role in the genesis of health and sickness. Even if it is no more important than genetics, it becomes a more serious practical consideration since it is easier to modify nurture than nature.

While the spouse-likeness mould is relatively simple, inexpensive and highly convincing in differentiating inheritance from the environment, it is not without its problems. For example, there have been enough incontrovertible studies to show that, even in marriage, there are factors which must be viewed as social and which dictate familial aggregation. For example, it is well known that the selection of a mate is in part a function of height, religion, economics and geography.

Summary and Conclusions

Even in this day and age, and with the expenditures of large amounts of money, time and energy the general consensus is that both inheritance and environment dictate health and sickness. What has still eluded us is a more precise estimate of their relative contributions of nature versus nurture. As but one current example, in the case of breast malignancies, one major point is now evident from the Nurses' Health Study (12-year look at 117,988 middle-aged women)(70) The contributions of inheritance are relatively small (approximately 2.5 per cent) This would tend to corroborate the cardinal role of the environment.

References

1. Editors Where next with Psychiatric Illness? Nature, 336: #6195, 95-9b, 10 November 1988
2. Lander, E.S. Splitting Schizophenia Nature 336: #6195, 105-106, 10 November 1988.
3. Shernington, R., Brynjolfsson, J., Petursson, H., Potter, M., Dudleston, K., Barraclough, B., Wasmuth, J., Dobbs, M., and Gurling, H. Localisation of a Susceptibility Locus for Schizophrenia on Chromosome 5 Nature 336: #6195, 164-170, 10 November 1988.
4. Kennedy, J.L., Giuffra, L.A., Moises, H.W , Cavalli-Sforza, L.L., Pakstis, A.J., Kidd, J.R., Castiglione, C.M., Sjogren, B. Wetterberg, L.,Kidd, K.K Evidence against linkage of schizophrenia to Markers on Chromosome 5 in a Northern Swedish Pedigree. Nature 336: #6195, 167-170, 10 November 1988
5. Williams, R.R. Nature, Nurture and Family Predisposition New England Journal of Medicine 318: #12, 769-771, 24 March 1988.
6. Sorenson, T.I.A., Nielson, G.G., Andersen, P.K., Teasdale, T.W. Genetic and Environmental Influences on Premature Death in Adult Adoptees. New England Journal of Medicine 318: #12, 727-732, 24 March 1988.
7. Cheraskin, E. The Nature/Nurture Controversy: Spouse-Likeness Revisited, Medical Hypothesis 33: #, 219-225, November, 1990.
8. Zajonc, R.B., Adelmann, P.K., Morphy, S.T., Niendenthal, P.M. Convergance in the Physical Appearance of Spouses. Motivation and Emotion 11: #4, 335-346, 1987.
9. Chazan, J.A., Winkelstein, W., Jr. Household Aggregation of Hypertension: Report of a Preliminary Study, Journal of Chronic Disease 17: 9-18, January 1964
10. Winkelstein, W., Jr., Kantor, S., Ibrahim, M., and Sackett, D.L. Familial Aggregation of Blood Pressure, Journal of the American Medical Association 195: #10, 848-850, 7 March 1966.
11. Winkelstein, W., Jr., Kantor, S., Ibrahim, M.A., Sackett, D.L. Remarks on the Analysis of Familial Aggregation of Blood Pressure in the Alameda County Blood Pressure Study. American Journal of Epidemiology 89: #6, 615-618, June 1969
12. Sackett, D.L. Studies of Blood Pressure in Spouses In: Oglesby, P. Epidemiology and Control of Hypertension 1975. Miani, Symposium Specialists.
13. Gearing, F.R., Clark, E., Gurney, P., Georgbe, A., Schweitzer, M.D. Hypertensions Among Relatives of Hypertensives: Progress Report of a Family Study.
14. Johnson, B.C., Epstein, F.H., Kjelsberg, M.O Distributions and Familial Studies of Blood Pressure and Serum Cholesterol Levels in a Total Community – Tecumseh, Michigan Journal of Chronic Disease 18: 147-160, February 1965.
15. Borhani, N.O., Slanksy, D., Garrey, W., Borkman, T. Familial Aggregation of Blood Pressure.American Journal of Epidemiology 890: #5, 5327-546, May 1969
16. Hayes, C.G., Tyroler, H. A. Cassell, J.C Family Aggregation of Blood Pressure in Evans County, Georgia. Archives of Internal medicine 128: #6, 965-975, December 1971
17. Havlik, R.J., Garrison, R.J., Feinleib, M., Kannel, W.B., Castelli, W.P., McNamara, P.M. Blood Pressure Aggregation in Families. American Journal of Epidemiology 110:#3, 304-312, September 1979.
18. Annest, J.L., Sing, C.F., Biron, P., Mongeau, J.G. Familial Aggregation of Blood Pressure and Weight in Adoptive Families. II: Estimation of the Relative Contributions of Genetic and Common Environmental Factors to Blood Pressure Correlations Between Family Members. American Journal of Epidemiology 110:#4, 492-503, October 1979
19. Suarex, L., Criqui, M., Barrett-Connor, E., E. Spouse Concordance for Systolic and Diastolic Blood Pressure American Journal of Epidemiology 118: #3, 345-351, September 1983
20. Iselius, L., Morton, N.E., Rao, D.C. Family Resemblance for Blood Pressure Human Heredity 33: #5, 277-286, September./October 1983.
21. Staessen, J., Bulpitt, C.J., Fagard, R., Joossens, J.V., Lifnen, P. Amery, A. Familial Aggregation of Blood Pressure, Anthropometric Characteristics and Urinary Excretion of Sodium and Potassium – A Population Study in Two Belgian Towns Journal of Chronic Disease 38: #5, 397-407, 1985
22. Perusse,L., LeBlanc, C., Tremblay, A., Allard, C., Theriault, G., Landry, F., Talbot, J., Bouchard, C. Familial Aggregation in Physical Fitness, Coronary Heart Disease Risk Factors and Pulmonary Function Measurements Preventive Medicine 16. 5, 607-615, September 1987
23 Patterson, T.L., Kaplan, R.M , Sallis, J.F., Nader, P.R. Aggregation of Blood Pressure in Anglo-American and Mexican-American Families. Preventive Medicine 16. #5, 607-625, September 1987.
24. Nash, F.A. The Occurrence of Cancer in Husbands and Wives. British Journal of Cancer 13 #4, 577-588, December 1959
25. Milham, S. Leukemia in Husbands and Wives. Science 148: 33666, 98-100, April 2 1965
26. Manfreidi, O., Gross, L. Cancer Morbidity in Married Couples. Journal of the American Geriatrics Society 16: #6, 680-685, June 1968
27. Robertson, M.G. Malignant Melanoma in Husband and Wife. Journal of the American Medical Association 217: #11, 1553, September 13, 1971.
28. Bauman, L. Melanoma in Relatives. Journal of the American Medical Association 218: #8, 1300-1301, November 22 1971.
29. Robinson, M.J. Familial Melanomas. Journal of the American Medical Association 220:#2, 277, April 10, 1972.
30 Smart, C.R., Carle, B.N. Malignany. Melanoma in Husband and Wife. Journal of the American Medical Association 232: #7, 705-706, May19, 1975.
31. Russ, J.E., Scanlon, E.F. Identical Cancers in Husband and Wife. Surgery, Gynaecology and Obstretrics 150: #5, 664-666, May 1980
32 Garn, S.M., Pao, E.M. Nutritional Problems and Nutritional Solutions in LongtermStudies of Growth and Ageing. In: Nutrition in a Mod World. Report on the Ninth Conference on Human Nutrition 1968. Columbus, The Ohio State University, p.33
33. Garn, S.M. The Earlier Gain and the Later Loss of Cortical Bone.1970. Springfield, Charles C. Thomas.
34. Garn, S.M., Owen, G.M. Clark, O.C. Ascorbic Acid: The Vitamin of Affluence (commentary). Ecology of Food and Nutrition 3: 151, 1974.
35. Garn, S.M., Clark, O.C., Ullman, B.M. Does Obesity Have a Genetic Basis in Man? Ecology of Food and Nutrition 4: #1, 57-59, 1975
36. Garn, S.M., Clark, D.C., Goire, K.E. Husband-Wife Similarities in Haemoglobin Levels. Ecology of Food and Nutrition 5. 47-50, 1976
37. Garn, S.M., Rowe, N.H., Cole, P.E. Husband-Wife Similarities in Dental Caries Experience. Journal of Dental Research 56: #2, 186, February 1977
38. Garn, S.M., Bailey, S.M., Cole, P.e., Higgins, I.T.T. Level of Education, Level of Income and Level of Fatness in Adults. American Journal of Clinical Nutrition 30: #5, 721-725, May 1977
39 Garn, S.M., Baioley, S M. Cole, P.E. Synchronous Fatness Changes in Husbands and Wives. American Journal of Clinical Nutrition 32: #12, 2375-2377, December 1979.
40. Garn, S.M., Cole, P.E., Bailey, S.M. Biochemical Resemblances Among People Living Together. Ecology of Food and Nutrition 8. 204-206, 1979.
41. Garn, S.M. Cole, P.E., Bailey, S.M. Living Together as a Factor in Family-Line Resemblances. Human Biology 51: #4, 565-587, December 1979
42 Garn, S.M., Bailey, S.M., Higgins, I.T.T. Effects of Socioeconomic Status, Family Line and Living Together on Fatness and Obesity. In: Lauer, R.M. and Shekell, R.B. Childhood Prevention of Atherosclerosis and Hypertension 1979. New York, Raven Press, pp 187-204.
43. Garn, S.M., Block, W.D, Solomon, M.A Lipids and Living Together American Journal of Clinical Nutrition 33: #7, 1714-1715, July 1980
44. Garn, S.M. Bailey, S.M., Solomon, M.A., Hopkins, P.J. Effect of Remaining Family Members on Fatness Prediction. American Journal of Clinical Nutrition 34: 148, 1981.
45. Garn, S.M., LaVelle, M., Pilkington, J.J. Obesity and Living Together. Marriage and Family Review 7:33, 1984.
46 Garn, S.M., LaVelle.M. Family-Line Origins of the Low-Fat and Low-Lean Child or Adolescent. In: Cohen, S.A. The Underweight Infant, Child and Adolescent. 1985. East Norwalk, Appleton-Century-Crofts, p 15
47. Garn, S.M. Family-Line and Socioeconomic Factors in Fatness and Obesity. Nutrition Reviews 44: #12, 381-386, December 1986
48 Garn, S.M., Sullivan, T.V., Hawthorne, V.M. The Education of One Spouse and the Fatness of the Other Spouse. American Journal of Human Biology (in press)
49. Garn, S.M., Sullivan, T.V., Hawthorne, V.M. Fatness and Obesity of the Parents of the Obese American Journal of Human Nutrition (in press)
50. Cheraskin, E., Ringsdorf, W.M., Jr., Setvaadmadja, A.T.S.H., Barrett, R.A., Sibley, G.T. and Reid, R.W. Environmental Factors in Blood Glucose Regulation. Journal of the American Geriatrics Society 16: #7, 823-825, July1968.
51. Cheraskin, E., Ringsdorf, W.M., Jr. Frequency of Reported Symptoms and Signs in the Dentist and His Wife. Geriatrics 23: #11, 158-60, November 1968.
52. Cheraskin, E., Ringsdorf, W.M., Jr. Familial Factors in Psychic Adjustment. Journal of the American Geriatrics Society 17: #6, 609-611, 1969.
53. Cheraskin, E., Ringsdorf, W. M., Jr. Familial Dietary Patterns: I. Daily Caloric Consumption Journal of Applied Nutrition 21: #3 & 4, 70-73, Winter 1969
54. Cheraskin, E., Ringsdorf, W.M., Jr. Familial Enzymic Patterns: I. Serum Glutamic Oxalacetic Transaminase (SGOT) in the Dentist and His Wife Nutrition Reports International 1: #2, 119-124, February 1970.
55. Cheraskin, E. and Ringsdorf, W.M., Jr. Familial Enzymic Patterns: II. Lactic Dehydrogenase (LDH) in the Dentist and His Wife. Nutrition Reports International 1: #2, 125-130, February 1970.
56. Cheraskin, E., Ringsdorf, W.M., Jr. Familial Clinical Patterns: I. Reported Symptoms and Signs in the Dentist and his Wife.
Geriatrics 25: #2, 123-126, February 1970.
57. Cheraskin, E., Ringsdorf, W.M., Jr. Familial Biochemical Patterns: Part I. Serum Cholesterol in the Dentist and his Wife. Journal of Atherosclerosis Research 11: #2, 247-250, May 1970.
58. Cheraskin, E., Ringsdorf, W.M., Jr. Familial Dietary Patterns: II. Daily Carbohydrate Consumption Journal of Applied Nutrition 22: #1-2, 17-22, Spring/Summer 1970
59. Cheraskin, E., Ringsdorf, W.M., Jr. Familial Biochemical Patterns: II. Serum Albumin Levels in the Dentist and His Wife. Nutrition Reports International 1: #5, 313-318, May 1970.
60. Cheraskin, E., Ringsdorf, W.M., Jr. Familial Dietary Patterns: Daily Vitamin A Consumption in the Dentist and His Wife. International Journal for Vitamin Research 40: #2, 125-130, 1970.
61. Cheraskin, E., Ringsdorf, W.M., Jr. Familial Dietary Patterns: III. Daily Fat Consumption. Journal of Applied Nutrition 22: #3 & 4, 68-72, 1970.
62. Cheraskin, E., Ringsdorf, W.M., Jr. Familial Dietary Patterns: IV. Daily Protein Consumption. Journal of Applied Nutrition 23: #1&2, 27-33, 1971.
63. Cheraskin, E., Ringsdorf, W.M., Jr., Hicks, B.S. The Sweet Sickness Syndrome: I. The Refined Carbohydrate Consumption. Journal of the International Academy of Preventive Medicine 1: #2, 107-120, Fall 1974.
64. Cheraskin, E., Ringsdorf, W.M., Jr., Medford, F.H. Familial Enzymic Patterns: III, Serum Glutamic Oxalacetic Transaminase (SGOT) in the Dentist and His Wife (final report). Nutrition Reports International 12: #1, 35-40, July 1975.
65 . Cheraskin, E., Ringsdorf, W.M., Jr., Medford, F.H. Familial Enzymic Patterns: IV. Lactic Dehydrogenase (LDH) in the Dentist and His Wife (final report). Nutrition Report International 12: #4, 239-243, October 1975.
66. Cheraskin, E., Ringsdorf, W.M. Jr., Medford, F.H. Familial Enzymic Patterns: V. Creatine Phosphokinase (CPK) in the Dentist and His Wife (final report). Nutrition Reports International 13: #2, 175-180, February 1976.
67. Cheraskin, E., Ringsdorf, W.M. Jr., Medford, F.H. Familial Enzymic Patterns: VI. Serum Glutamic Pyruvic Transaminase (SGPT). Nutrition Reports International 13: #2, 181-186, February 1976.
68. Ringsdorf, W.M., Jr., Cheraskin,E. and Medford, F.H. Familial Biochemical Patterns: III. Haemoglobin Levels in the Dentist and His Wife. Ecology of Food and Nutrition 8: 123-126, August 1979.
69. Cheraskin, E. The Relationship of Hematocrit in Husbands and Wives (unpublished data).
70. Colditz, G.A., Willett, W.C., Hunter, D.J., Stampfer, M.J., Manson, J.E. Hennekens, C.H., Rosner, B.A., Speizer , F.E. Family History, Age and Risk of Breast Cancer: Prospective Data from the Nurses' Health Study. Journal of the American Medical Association 270 #3, 338-343, July 21 1993