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DAILY PHENYLALANINE CONSUMPTION AND PSYCHOLOGIC STATE

by

E. Cheraskin, M.D., D.M.D.
Professor in Oral Medicine

and

W. M. Ringsdorf, Jr., D.M.D., M.S.
Associate Professor in Oral Medicine

From the Department of Oral Medicine, University of
Alabama Medical Center, Birmingham, Alabama

Abstract

Two hundred fifteen presumably healthy dentists and their wives participated in an experiment in which daily phenylalanine consumption, as judged by a dietary frequency questionnaire, was correlated with psychologic state as measured by a controlled association test.

The results show no relationship between phenylalanine intake and psychic rating. This is particularly interesting since an earlier report showed a statistically significant relationship between daily tryptophane consumption and psychologic state. Thus, the protein-tryptophane-niacin interrelationships with psychic state do not seem to exist with this particular amino acid.

Introduction

Four interdependent observations serve as a prelude to and justification for this report. First, the literature is replete with evidence to underscore the relationship of hyponiacinosis and pellagra [1,2]. Second, numerous reports in recent times have indicated the utility of megavitamin B₃ therapy in seemingly nonpellagrous psychologic disorders [schizophrenia] [3,4]. Third, there is reasonable proof that tryptophane is a precursor of nicotinic acid [5,6]. Finally, limited data suggest a positive correlation between psychologic rating scores and protein-nicotinic acid consumption in subjects who, by all traditional criteria, are neither schizophrenic or pellagrous [7,8].

This report is designed to cast additional light upon the possible interdependency of the four items just listed by a study of the relationship between daily phenylalanine intake and psychologic state in subjects who are apparently without schizophrenia and pellagra. Specifically, an attempt will be made to answer the following four questions:

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1. What is the daily phenylalanine consumption of a sample of presumably healthy subjects?
2. How do the findings compare with the Recommended Dietary Allowances?
3. Is there any relationship between the daily phenylalanine intake and psychologic state?
4. Of what significance are these findings?

Method of Investigation

Two hundred fifteen presumably healthy dentists and their wives [including five children] shared in this experiment. These individuals are currently participating in a multiple testing health evaluation program in Los Angeles under the sponsorship of the Southern California Academy of Nutritional Research, in Columbus under the auspices of the Ohio Academy of Clinical Nutrition, and in Tampa under the aegis of the Southern Academy of Clinical Nutrition. The age and sex distributions are summarized [Table I].

Table I
age and sex distribution

age groups	male group	female group	total group
10-19	2 [1.6%]	2 [2.2%]	4 [1.9%]
20-29	4 [3.2%]	13 [14.3%]	17 [7.9%]
30-39	43 [34.7%]	27 [29.7%]	70 [32.6%]
40-49	40 [32.3%]	30 [33.0%]	70 [32.6%]
50-59	28 [22.6%]	16 [17.6%]	44 [20.5%]
60-69	7 [5.6%]	3 [3.3%]	10 [4.7%]
total	124 [100.0%]	91 [100.0%]*	215 [100.0%]*
mean	43.4	40.6	42.2
S.D.	9.9	10.3	10.1
t	2.006		
P	<0.05**		
minimum	13	14	13
maximum	67	63	67
range	54	49	54

* approximate

**statistically significant difference of the means

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Each subject completed a Dietronics Dietary Analysis form. This technique is based upon significant observations in Israel [9] and England [10] which suggest that the most practical method for deriving data is by means of a food frequency questionnaire. Dietronics Dietary Analysis consists of a simple questionnaire completed by the subject in the matter of a few minutes. The form is submitted for computer analysis, and a printout is returned showing the daily intake of the major foodstuffs, the most common vitamins and minerals, and the essential amino acids. By this method, it is possible to ascertain daily the quantity of each essential amino acid consumed. For purposes of this report, only phenylalanine will be considered. Table II summarizes the findings.

Table II
daily phenylalanine consumption

daily phenylalanine intake [mgm.]	male group	female group	total group
<1100	0 [0.0%]	1 [1.1%]	1 [0.5%]
1100-2199	4 [3.2%]	10 [11.0%]	14 [6.5%]
>2200	120 [96.8%]	80 [87.9%]	200 [93.0%]
total	124 [100.0%]	91 [100.0%]	215 [100.0%]
mean	3988	3507	3783
S.D.	1285	1157	1254
t	2.880		
P	<0.010*		
minimum	1490	815	815
maximum	7515	6610	7515
range	6025	5795	6700

*statistically significant difference of the means

Finally, each subject completed the Cornell Word Form-2 [abbreviated CWF-2]. This questionnaire is a modification of the ordinary type of individually-administered word association technique in that it is a forced choice method [11]. The subject is presented with a list of stimulus words, each followed by two other [response] words. The subject is asked to choose the one he or she thinks relates better with the stimulus word. The CWF-2 has been devised as an instrument to make quickly a descriptive sketch of the individual's attitude, feeling states and emotions or bodily reactions for clinical interpretation. It has been devised to do so in a manner not readily discernable to the subject in order to enhance the degree of objectivity. The results are summarized [Table III].

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Table III
Cornell word form-2 [CWF-2] distribution

CWF-2 scores	male group	female group	total group
0	45 [36.3%]	20 [22.0%]	65 [30.2%]
1-2	56 [45.2%]	45 [49.5%]	101 [47.0%]
3-4	13 [10.5%]	14 [15.4%]	27 [12.6%]
5-6	8 [6.5%]	9 [9.9%]	17 [7.9%]
7-8	2 [1.6%]	0 [0.0%]	2 [0.9%]
9-10	0 [0.0%]	3 [3.3%]	3 [1.4%]
total	124 [100.0%]*	91 [100.0%]*	215 [100.0%]
means	1.4	2.0	1.7
S.D.	1.7	2.1	1.9
t		2.136	
P		<0.05**	
minimum	0	0	0
maximum	8	10	10
range	8	10	10

* approximate

**statistically significant difference of the means

Results

Question One: Table II summarizes the daily phenylalanine intake for the entire sample and the sexes separately. Several points deserve special mention. First, for the entire group, there is considerable variation ranging from a low of 815 to a high of 7515 mgm. phenylalanine intake per day. Hence, there is an eleven-fold range. Second, the mean consumption is considerable higher in the male than the female. Finally, the range is broader in the male than in the female group.

Question Two: According to the Food and Nutrition Board of the National Research Council, the Recommended Dietary Allowance [RDA] [12] for phenylalanine is 2200 mgm. per day for both the reference man and woman. On this basis, 3.2 and 12.1 per cent of the male and female groups, respectively, are consuming suboptimal amounts of phenylalanine.

Question Three: The group was subdivided into two subcategories based upon age [Table IV]. One group of 105 subjects were under 42 years; the remaining 110 subjects were 42 or more years of age. Furthermore the entire group was subdivided into those individuals consuming less than 3500 mgm. phenylalanine per day versus those with an intake of

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Table IV
relationship of daily phenylalanine
consumption and Cornell Word
Form-2 [CWF-2] scores

	<42 years daily phenylala- nine intake		42+ years daily phenylala- nine intake	
	<3500 mgm.	3500+ mgm.	<3500 mgm.	3500+ mgm.
	sample sizes	48	57	53
mean CWF-2 scores	1.7	1.7	1.8	1.4
t	0.020		1.054	
P	>0.500		>0.200	

3500+ mgm. daily. Table IV summarizes the findings for the four subgroups. It will be noted that, in the younger category [<42 years of age], the mean psychologic scores were not statistically significantly different in terms of daily phenylalanine intake [t = 0.020, P >0.500]. Additionally, in the older group, the findings were essentially the same.

Discussion

It must be admitted that the sample is unusual and that it is composed almost exclusively of members of the health profession and their wives. From a qualitative standpoint, the men consumed greater amounts of phenylalanine [Table II] and displayed better psychologic scores [Table III]. The most apparent quantitative observation is the fact that there is no statistically significant relationship between psychologic state [as judged by the CWF-2] and dietary phenylalanine consumption. These data are significant for several reasons.

Question Four: An earlier report [13] demonstrated a significant correlation between psychologic state and tryptophane intake in older subjects. The question naturally arose as to whether this was a specific parallelism between psychologic state and a specific amino acid [tryptophane] or whether such a relationship obtained also with other amino acids. Within the limits of this study, there is no correlation between psychologic scores and phenylalanine. This is at least circumstantial evidence that the previously reported findings are uniquely correlated with one essential amino acid, namely, tryptophane.

 Details regarding the method for dietary analysis may be obtained from the Hanson Research Corporation, Post office Box 35, Northridge, California 91324.

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