Protein Consumption and Cardiovascular Complaints

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Introduction

The increasing efforts to identify dietary factors in the genesis of heart disease have been largely directed to the fats (saturated versus unsaturated) and, more recently, to the carbohydrates (complex versus simple). In a review of the literature only one reference (Pilgeram *et al.* 1964) to a possible correlation of *protein* consumption and heart disease was noted. Specifically, in a group of men with proven myocardial infarction, plasma albumin (an essential receptor of free fatty acid produced by the lipoprotein lipase clearing system) was shown to be significantly deficient. This co-factor defect of the fat clearing mechanisms was shown to be corrected, *in vitro,* by the addition of electrophoretically pure human albumin. These data may prove quite significant when considered in the light of relationship between dietary and serum proteins. The following report is intended to relate dietary protein intake with *early* characteristic, if not pathognomonic, findings suggestive of cardiovascular pathosis in relatively healthy individuals.

Method of Investigation

Seventy-four dental practitioners and their wives (members of the Southern Academy of Clinical Nutrition) shared in this experience. The relevant raw data are included (Table I). It will be noted that the majority of the subjects were in the fourth decade (Table II). Each of the participants completed the Cornell Medical Index Health Questionnaire (Brodman *et al.* 1949). Thirteen of the questions (Table III) concern cardiovascular symptoms and signs. Table IV shows the frequency distribution of affirmative responses. It is clear that the majority (41 of the 74 persons) reported no positive answers. However, affirmative answers ranged to a height of seven in one person. Each subject also submitted a seven-day dietary record and protein consumption was calculated (U.S. Agriculture Handbook No. 8, 1963). Summarized is the daily *total* protein intake expressed in grams per day (Table V). On the basis of recognized protein requirements (Pub. 1146. Nat. Acad. Sci. 1964), there is no gross protein deficiency. Since the difference in nutritive value of animal versus vegetable protein is frequently emphasized, outlined also (Table V) is the daily *animal* and *vegetable* protein consumption. On the basis of the available evidence, animal protein consumption is much greater than the consumption of vegetable protein foodstuffs.

RESULTS

The 74 individuals were divided as nearly equal as possible into two categories in terms of animal protein consumption (Table VI). By this technique, 38 subjects consumed the lesser (9-75g.) and 36 the greater (76-160g.) intake. Likewise, the 74 subjects were divided on the basis of vegetable protein intake with 37 consuming the lesser (7-19g.) and 37 ingesting the greater (20-40) amount.

Table VI summarizes the mean cardiovascular scores in terms of animal and vegetable protein singly and in combination. First, the mean score for the entire group (n=74) is 0.97. The average score for the group consuming the greater amount of animal protein (76-160g.) versus lesser consumption (9-75g.) irrespective of vegetable protein is 0.56 versus 1.37 respectively. Table VI also shows that the greater the vegetable protein intake (irrespective of animal protein), the lower the mean score (0.73 versus 1.21). Finally, Table VI demonstrates that the highest mean score (1.81 positive responses per person) occurs in the group with the smaller vegetable and animal protein intake.

There is general agreement that one of the important ingredients in chronic disease is time (duration). In other words, not only must there be a problem, but it must be extended in time in order to produce visible evidence of illness. Accordingly, the sample has been

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TABLE I

Relationship of Cardiovascular Complaints and Daily Protein Consumption

Case details Age	Sex	Total Protein Intake	Animal Protein Intake	Vegetable Protein Intake	No. of Cardiovasc. Complaints	Case details Age	Sex	Total Protein Intake	Animal Protein Intake	Vegetable Protein Intake	No. of Cardiovasc. Complaints
33	M	99	78	21	1	25	F	96	76	20	1
32	F	93	68	25	0	47	F	43	30	13	3
37	M	135	105	30	0	49	M	102	75	27	0
37	F	105	86	19	0	41	F	106	68	38	1
32	M	111	89	22	6	38	M	128	99	29	0
32	F	103	79	24	1	27	F	72	60	12	0
40	M	123	95	28	0	35	M	91	67	24	0
34	M	109	87	22	0	43	M	121	105	16	1
33	F	96	76	20	0	42	F	67	54	13	2
36	F	64	38	26	0	41	M	89	73	16	0
36	M	88	54	34	3	43	M	97	88	9	0
40	M	131	100	31	0	45	F	73	63	10	0
38	F	68	58	10	1	33	F	22	9	13	0
41	M	120	108	12	1	36	M	140	115	25	0
32	F	124	113	11	0	55	F	64	47	17	5
30	M	158	128	30	0	56	M	112	85	27	0
44	F	85	67	18	4	33	F	70	55	15	3
47	M	99	80	19	0	32	M	106	73	33	0
41	M	113	90	23	2	32	F	78	57	21	0
38	F	75	58	17	0	34	M	103	87	16	0
41	M	90	72	18	0	48	F	103	87	16	1
47	F	83	69	14	7	48	M	113	88	25	1
48	M	86	66	20	1	39	M	86	63	23	2
34	M	160	133	27	0	36	F	60	46	14	2
23	F	83	65	18	1	37	M	93	76	17	0
33	M	190	160	30	0	40	F	87	80	7	0
32	F	127	104	23	0	40	M	123	108	15	1
46	M	95	76	19	0	41	F	63	48	15	0
39	M	101	85	16	0	44	M	80	69	11	5
32	F	85	70	15	0	42	M	109	94	15	0
39	F	52	36	16	1	34	F	76	48	28	2
50	M	67	49	18	0	36	M	142	112	30	1
30	F	83	61	22	1	40	M	112	72	40	0
37	M	94	81	13	1	40	F	67	43	24	2
49	F	51	33	18	4	32	M	125	93	32	0
48	M	109	75	34	2	31	F	70	39	31	0
35	M	115	97	18	2	34	M	95	69	26	0

TABLE II

Age and Sex Distribution

Age Groups	Male	Female	Total
20-29	0 (0.0%)	3 (9.1%)	3 (4.1%)
30-39	21 (51.2%)	18 (54.5%)	39 (52.7%)
40-49	18 (43.9%)	11 (33.3%)	29 (39.2%)
50-59	2 (4.9%)	1 (3.0%)	3 (4.1%)
Total	41 (100.0%)	33 (100.0%)*	74 (100.0%)*

*Approximate

TABLE III

Cardiovascular Questions in the Cornell Medical Index Health Questionnaire

1. Has a doctor ever said your blood pressure was too high?
2. Has a doctor ever said your blood pressure was too low?
3. Do you have pains in the heart or chest?
4. Are you often bothered by thumping of the heart?
5. Does your heart often race like mad?
6. Do you often have difficulty in breathing?
7. Do you get out of breath long before anyone else?
8. Do you sometimes get out of breath just sitting still?
9. Are your ankles often badly swollen?
10. Do cold hands or feet trouble you even in hot weather?
11. Do you suffer from frequent cramps in your legs?
12. Has a doctor ever said you had heart trouble?
13. Does heart trouble run in your family?

TABLE IV

Distribution of Cardiovascular Complaints

No. of Cardiovascular Complaints	Male	Female	Total
0	26 (63.4%)	15 (45.5%)	41 (55.4%)
1	8 (19.5%)	8 (24.4%)	16 (21.6%)
2	4 (9.8%)	4 (12.1%)	8 (10.8%)
3	1 (2.4%)	2 (6.1%)	3 (4.1%)
4	0 (0.0%)	2 (6.1%)	2 (2.7%)
5	1 (2.4%)	1 (3.0%)	2 (2.7%)
6	1 (2.4%)	0 (0.0%)	1 (1.4%)
7	0 (0.0%)	1 (3.0%)	1 (1.4%)
Total	41 (100.0%)*	33 (100.0%)*	74 (100.0%)*

* Approximate

TABLE V

Distribution of Daily Protein Consumption

Daily Protein Intake (grams)	Total Protein Consumption	Animal Protein Consumption	Vegetable Protein Consumption
0- 19	0 (0.0%)	1 (1.4%)	37 (50.0%)
20- 39	1 (1.4%)	5 (6.8%)	36 (48.9%)
40- 59	3 (4.1%)	12 (16.2%)	1 (1.4%)
60- 79	15 (20.3%)	26 (35.1%)	0 (0.0%)
80- 99	23 (31.1%)	18 (24.3%)	0 (0.0%)
100-119	17 (23.0%)	9 (12.2%)	0 (0.0%)
120-139	10 (13.5%)	2 (2.7%)	0 (0.0%)
140-159	3 (4.1%)	0 (0.0%)	0 (0.0%)
160-199	2 (2.7%)	1 (1.4%)	0 (1.0%)
Total	74 (100.0%)	74 (100.0%)*	74 (100.0%)*

* Approximate

TABLE VI
Relationship of Cardiovascular Complaints and Daily Animal and Vegetable Protein Consumption

Daily Vegetable Protein Intake	Daily Animal Protein Intake					
	9-75 grams		76-160 grams		Total	
7-19 grams	(21)*	1.81	(16)	0.44	(37)	1.21
20-40 grams	(17)	0.82	(20)	0.65	(37)	0.73
Total	(38)	1.37	(36)	0.56	(74)	0.97

* Sample size

TABLE VII
Summary of Mean Number of Cardiovascular Complaints

Age Category	Sample Size	Animal Protein Intake	Vegetable Protein Intake	Mean No. of Cardiovascular Findings
Older	15	Lower	Lower	2.13
Older	7	Lower	Higher	1.14
Younger	6	Lower	Lower	1.00
Younger	14	Higher	Higher	0.71
Younger	10	Lower	Higher	0.60
Older	6	Higher	Higher	0.50
Younger	6	Higher	Lower	0.50
Older	10	Higher	Lower	0.40

further subdivided by age into two near-equal subgroups.

Table VII summarizes the mean number of cardiovascular complaints in terms of age and the quality and quantity of ingested protein. It is noteworthy that the mean number of cardiovascular findings is greatest (2.13 per subject) in the older individuals (n=15) with both relatively low intake of animal and vegetable protein. In fact, the three subgroups characterized by the lower animal protein show the greatest number of cardiovascular symptoms and signs (2.13, 1.14, and 1.00). In contrast, the three groups characterized by the relatively high animal protein consumption display the least number of cardiovascular findings (0.40, 0.50, and 0.50).

DISCUSSION

A comparison of these findings with those previously reported in connection with carbohydrate consumption and cardiovascular findings discloses two important differences. First, carbohydrate intake and cardiovascular symptoms and signs related *positively*. In other words, the greater the carbohydrate consumption, the more the complaints. In contrast, the relationship of protein intake and cardiovascular score in this paper is *negative*. Second, a comparison of the carbohydrate and protein studies discloses that the latter relationship is more sharply defined. (Cheraskin *et al.* in press).

It is recognized that dietary analysis, at best, is crude. It is also noted that the cardiovascular history derived from the Cornell Medical Index Health Questionnaire is gross. Finally, it is well to emphasize that the conclusions, in the form of relationships, do not prove cause-and-effect. Notwithstanding, the correlations (the first such recorded) could be tested by noting cardiovascular state following the addition and elimination of protein.

Individuals who consume large amounts of carbohydrate very frequently eat less protein. Hence, one wonders whether the findings in this report and those in the earlier one may not be related purely on this reciprocal basis. For this reason, a report to follow will consider the frequency of cardiovascular complaints in four dietary groups: (1) high protein and high carbohydrate, (2) high protein and low carbohydrate, (3) low protein and high carbohydrate, and (4) low protein and low carbohydrate.

SUMMARY

1. This is a study of the correlation of cardiovascular complaints (elicited from the Cornell Medical Index Health Questionnaire) and daily animal and vegetable protein consumption in 74 dental practitioners and their wives.
2. The results suggest a greater frequency of positive cardiovascular responses in the relatively older persons who consumed lesser quantities of protein, particularly of the animal variety.
3. The findings reported here with protein are reciprocally related to those previously described with carbohydrate consumption (Cheraskin *et al.* (A)). For this reason together with the observation that persons who eat large amounts of carbohydrate frequently do not consume much protein, a report will follow (Cheraskin *et al.* (B)) which analyzes cardiovascular complaints in the light of *both* carbohydrate and protein consumption.

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