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FAMILIAL BIOCHEMICAL PATTERNS: III. HEMOGLOBIN LEVELS IN THE DENTIST AND HIS WIFE

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Five hundred and sixteen adult subjects were divided into three groups—172 dentists, their 172 wives and 172 other women aged-paired to the wives—who were studied in terms of similarities in their hemoglobin levels. The data reveal a statistically significant coefficient of correlation (r= +0.317) only in the married couples. This together with a higher correlation in the older (r=+0.347) versus the younger (r=+0.275) couples indicates the possible influence of environmental forces. It is concluded that husbands and wives become alike chemically largely because they have similar social (alcohol, tobacco), dietary, sleeping and exercise habits and are subjected to similar psychic stresses.

KEY WORDS—Familial; hemoglobin; environmental; husband-wife similarities.

Many of the conditions, disorders or diseases which show familial patterns have frequently been explained on a genetic basis. However, studies of husbands and wives indicate that a person's health state may be as closely related to environmental lifestyles as to the transmission of genetic traits.

The two earlier reports in this series were evaluations of serum cholesterol (Cheraskin and Ringsdorf, 1970a) and serum albumin (Cheraskin and Ringsdorf, 1970b) levels in 115 dental practitioners, their 115 wives, and 115 other women age-paired to the wives. The results showed for the entire group a statistically significant correlation coefficient between serum cholesterol levels only in the married couples. Within the limits of this study the evidence indicates that this is not the result of natural selection in the married couples on the basis of health status. Rather, the parallelisms become significant only with the increasing number of years together. Serum albumin levels for the entire sample also showed a statistically significant correlation only between the husbands and wives. In this regard, the findings are very similar to those reported for serum cholesterol. However, the husband-wife correlation of serum albumin did not increase with age as noted for serum cholesterol.

Table I is a summary of husband-wife correlation coefficients by the authors for the entire sample and for the younger and older couples in terms of clinical findings (Cheraskin and Ringsdorf, 1968a, 1969a, 1970c), biochemical observations (Cheraskin and Ringsdorf, 1968b, 1970a, 1970b), enzymic determinations (Cheraskin and Ringsdorf, 1970d, 1970e; Cheraskin, Ringsdorf and Medford, 1975a, 1975b, 1976), and dietary patterns (Cheraskin and Ringsdorf, 1969b, 1970f; Cheraskin, Ringsdorf, and Hicks, 1974). It is noteworthy, that of all the familial parameters studied, only one correlation coefficient (SGPT) is not statistically significant in the older couples.

Garn and co-workers independently and with-

TABLE I

Correlation coefficients for selected health parameters in husbands and wives

Parameter	Entire sample	Married couples younger	Married couples older
general symptoms and signs	+0.345[b]	+0.264[a]	+0.412[a]
psychologic findings	+0.286[a]	+0.124	+0.502[a]
serum cholesterol	+0.455[a]	+0.174	+0.588[b]
serum albumin	+0.387[b]	+0.401[b]	+0.365[b]
daily total caloric consumption	+0.425[b]	+0.419[b]	+0.336[a]
daily total carbohydrate intake	+0.528[b]	+0.473[b]	+0.652[a]
daily refined carbohydrate intake	+0.520[b]	+0.442[b]	+0.669[b]
SGOT (preliminary report)	+0.215	−0.023	+0.686[b]
SGOT (final report)	+0.338[b]	+0.362[b]	+0.318[b]
LDH (preliminary report)	+0.892[b]	+0.937[b]	+0.877[b]
LDH (final report)	+0.896[b]	+0.948[b]	+0.840[b]
CPK	+0.762[b]	+0.714[b]	+0.806[b]
SGPT	+0.185[a]	+0.290[a]	+0.085

[a] $P < 0.05$
[b] $P < 0.01$

out knowledge of the previously cited papers, observed that

> since genetically-unrelated subjects (husbands and wives) were about as similar, fatwise, as genetically-related individuals (sibling pairs and parent-child pairs), there is no compelling evidence at present for purely genetic control of fatness (Garn, Clark, and Ullman, 1975).

Their findings on several thousand pairs of individuals from three different survey studies are good evidence that living together (or lifestyle) plays a significant role in familial fatness. The coefficient of correlation in their study was 0.25.

In 2826 pairs of spouses from the Ten-State Nutrition Survey of 1968–1970, Garn and his associates observed that there is a systematic significant husband-wife similarity in hemoglobin level (Garn, Clark, and Guire, 1976). They found the husband-wife hemoglobin correlation significant at each of five decades studied (20–60) and in both whites and blacks. The correlation coefficient approximated 0.20 in this sample over the five decades. However, the data revealed no age-associated trend. That is, no increase in correlation in the older couples. Thus, the husband-wife similarity in this report was not markedly affected by the duration of marriage. Since income and hemoglobin levels are correlated, this factor was also analyzed. Correction for per capita income, however, left the values virtually unchanged.

At the extremes of hemoglobin levels, Garn and his associates found the husband-wife similarities to be more pronounced. Thus, wives of high-hemoglobin husbands were as much as 0.7–0.8 gm/100 dl higher than wives of low-hemoglobin husbands.

The authors concluded that the similarities observed "reflect both diet and nutrition in common, for individuals sharing up to 21 meals per week in common."

This report was designed to analyze the hemoglobin level in married couples as a method of determining the relative importance of genetic versus environmental factors in hematopoiesis. Specifically, an attempt will be made to answer the following three questions: (1) Is there a relationship between hemoglobin levels in a husband and his wife? (2) How does the husband-wife correlation compare with that of the husband and an aged-paired, unrelated female group? (3) What conclusions may be drawn from these relationships?

MATERIALS AND METHODS

To investigate the environmental influence upon the blood hemoglobin level, 516 adult subjects were divided into three groups—172 dentists, their 172 wives and 172 women aged-paired to the wives. The age distribution may be observed in Table II.

Hemoglobin level distribution among the 516 subjects is summarized in Table III. Individual

TABLE II

Age distribution of a sample of dentists, their wives and unrelated women serving as a control group

Age groups	Males		Wives		Unrelated women	
20–29	4	2.3	18	10.5	18	10.5
30–39	71	41.3	84	48.8	84	48.8
40–49	73	42.4	58	33.7	58	33.7
50–59	20	11.6	10	5.8	10	5.8
60–69	4	2.3	2	1.2	2	1.2
total	172	100.0	172	100.0	172	100.0
mean	41.5		37.8		37.8	
S.D.	7.5		7.2		7.2	
minimum	28		24		24	
maximum	64		60		60	
range	36		36		36	

TABLE III

Distribution of hemoglobin levels in a sample of dentists, their wives and a control group of age matched unrelated women

Hemoglobin groups (grams/dl)	Males		Wives		Unrelated women	
10–10.9	0	0.0	1	0.6	0	0.0
11–11.9	0	0.0	3	1.7	3	1.7
12–12.9	3	1.7	32	18.6	28	16.3
13–13.9	6	3.5	67	39.0	69	40.1
14–14.9	36	20.9	44	25.6	51	29.7
15–15.9	78	45.3	24	14.0	20	11.6
16+	49	28.5	1	0.6	1	0.7
total	172	100.0	172	100.0	172	100.0
mean	15.5		13.8		13.8	
S.D.	1.0		1.0		0.9	
minimum	12.4		10.3		11.1	
maximum	18.1		15.9		16.1	
range	5.7		5.6		5.0	
P	<0.001[a]		>0.500			

[a] statistically significant difference

levels ranged from 12.4 grams per deciliter to 18.1 grams in the males and from 10.3 to 16.1 grams in the females.

RESULTS AND DISCUSSION

Question one: A correlation coefficient was performed for the hemoglobin in the husbands and their wives (Table IV). The relationship was statistically significant ($r=+0.317$, $P<0.01$). Thus, in answer to the first question, hemoglobin levels are similar in married couples. In other words dentists with relatively high hemoglobin levels have wives with relatively high levels; conversely, those with low or intermediate levels are living with women who have low or intermediate levels, respectively.

Question two: To answer the second question a correlation coefficient was determined between the dentist and the women aged-paired to their wives. This group will be referred to as the unrelated women. The relationship between these groups was not statistically significant (Table IV). In answer to the second question, there is no significant correlation of hemoglobin levels in men and women unrelated by marriage.

Within the limits of this analysis, hemoglobin levels are significantly correlated in husbands and their wives. However, this relationship is not evident when the unrelated women and husbands are compared.

Although there is no test for homogamy (preferential mating), the data was regrouped to see if the length of marriage plays a role in this familial hemoglobin relationship.

Question three: The coefficients of correlation between the younger (husband's age <41) and older (husband's age 41+) couples were both statistically significant; however, it was higher in the older group (Table IV). A similar analysis between the husband and the unrelated women showed no statistically significant relationships; and, the coefficient of correlation was lower in the older group (Table IV).

Thus, in answer to the third question, the evidence suggests that couples become more alike hematologically as their marriage matures. For these couples similar environmental influences are making them more alike as they continue living together. These environmental forces take many forms and include such factors as psychic stress, sleeping pattern, physical activity and dietary and social (tobacco, alcohol) habits.

TABLE IV

Correlation coefficients for hemoglobin levels in dentists, their wives and a control group of unrelated women

	number of pairs	r	P
Husband versus wife	172	+0.317	<0.01[a]
Husband versus unrelated woman	172	+0.079	>0.05
Wife versus unrelated woman	172	+0.141	>0.05
Husband versus wife			
(husband's age <41)	86	+0.275	<0.01[a]
(husband's age 41+)	86	+0.347	<0.01[a]
Husband versus unrelated woman			
(husband's age <41)	86	+0.117	>0.05
(husband's age 41+)	86	+0.045	>0.05
Wife versus unrelated woman			
(age <39)	94	−0.008	>0.05
(age 39+)	78	+0.301	<0.05[a]

[a] statistically significant difference

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