

# Association Between Serum Cholesterol and Serum Organochlorine Residues

by M. N. RASHAD and M. P. MI

*Department of Genetics and*

*Cancer Center, University of Hawaii*

H. W. KLEMMER, A. M. BUDY and E. L. REICHERT\*

*PBRC-Hawaii Epidemiologic Studies Program*

*University of Hawaii*

Variations in age, sex and race in serum organochlorine residues among 1,619 individuals in Hawaii have been reported by KLEMMER et al. (1973). They compared residue levels of an urban population with a rural population and observed significant differences in serum organochlorine levels. In the rural sample, serum levels were highest among Filipinos for p,p'DDT and p,p'DDE; highest among Japanese for  $\beta$ -BHC, and highest among Caucasians for dieldrin. In the urban sample, levels of p,p'DDT, p,p'DDE and dieldrin were significantly lower among Caucasians than among Hawaiians, Filipinos or Japanese. It was suggested that these significant variations may be related to differences in exposure or to differences in metabolism or storage of pesticides.<sup>1</sup>

We have confirmed these results in a larger population sample. In addition, we have observed a statistical association between cholesterol and serum organochlorine pesticide residues.

## METHODS

Our sample population of 3,568 subjects is a subset of a sample of 10,951 individuals attending the health appraisal center at the Pacific Health Research Institute during the period July 1969 to December 1970. The subjects represent the community at large over a wide occupational range; many were referred for pre-employment or annual physical examinations. The total examination included medical history, physical examination, pesticide exposure history, diet history and laboratory procedures.<sup>2</sup>

Biochemical studies were done by a SMA/12 channel autoanalyzer. Serum cholesterol was measured on 9,885 subjects and serum organochlorine residues in 3,568 subjects. Linear regression analysis using the least square method was done to determine significant associations.

\* Present address: State of Hawaii, Department of Health.

## RESULTS AND DISCUSSION

Shown in Table 1 are the means and standard deviations of the variables studied.

TABLE 1

Serum cholesterol and organochlorine  
residues among 3,568 subjects

Variable	Mean	SD
Cholesterol	221.5 mg%	39.0
p,p'DDT	5.1 ppb	5.1
p,p'DDE	25.4 ppb	26.7
Dieldrin	2.4 ppb	14.3
$\beta$ -BHC	0.7 ppb	1.5
Pentachlorophenol	0.5 ppb	1.7

After adjusting for age, sex and race effects, cholesterol values associated significantly only with p,p'DDT and p,p'DDE residues (Table 2).

TABLE 2

Variation in serum cholesterol among 3,568 subjects  
expressed as partial regression coefficients

Variable	b
Age	3.26**
Sex	0.05
p,p'DDT	0.24
p,p'DDE	0.12**
Dieldrin	0.07
$\beta$ -BHC	-0.23
Caucasian	-1.04
Part-Hawaiian	-3.83
Filipino	-0.53
Japanese	4.14**

The association between p,p'DDT and cholesterol was highly significant but, in regression analysis, this significance was suppressed by a secondary interaction with p,p'DDE (Table 3). The association with p,p'DDE remained significant.

TABLE 3

Variation in serum cholesterol among 3,568 subjects  
expressed as partial regression coefficients

Variable	b
Age	5.18**
Sex	0.14
p,p'DDE	0.15**
Caucasian	-1.03
Part-Hawaiian	-4.01
Filipino	-0.50
Japanese	4.4**

Two alternative explanations are suggested: (1) p,p'DDE could induce an increase in the synthesis of serum cholesterol; or (2) an excessive intake of cholesterol could be associated with a diet high in p,p'DDT which is converted in the body to p,p'DDE. Simultaneous adjustment for a detailed dietary questionnaire was carried out and the results show significant association with cholesterol after adjusting for possible dietary interaction.

From the results of this study, we suggest that p,p'-DDE may stimulate synthesis of cholesterol in the liver, leading to an elevated serum cholesterol.

#### ACKNOWLEDGMENT

This study was supported by the Pacific Health Research Institute, Honolulu, and the Epidemiologic Studies Program, Tech. Services Div., Office of Pesticide Programs, EPA, under contract No. 68-02-0560. The views expressed herein are those of the investigators and do not necessarily reflect the official viewpoint of the supporting agencies.

#### REFERENCES

1. KLEMMER, H.W., RASHAD, M.N., and MI, M.P.: in W.B. Deichmann (Ed.) Pesticides and the environment: A continuing controversy. North Miami, Florida: Symposium Specialists 1973.
2. RASHAD, M.N., MI, M.P., GILBERT, F. and STIBOLT, D.: Biomedical profile of the population in Hawaii. Technical Report No. 4, Honolulu, Hawaii: Data & Computation Unit, Cancer Center 1974.