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## Short Note

# Plasma Lipid Variability in the Toronto Twin Register

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Plasma lipids were studied on 92 pairs of twins (66 MZ and 26 like-sexed DZ). The DZ twins had significantly greater total variance than the MZ twins for total plasma cholesterol but not for triglycerides or the high, low, and very low-density lipoprotein cholesterol fractions.

**Key words:** Cholesterol, Triglycerides, Lipoproteins, Genetic analysis, Twins

## INTRODUCTION

Results of the United States National Heart, Lung, and Blood Institute (NHLBI) Twin Study reported at the First International Congress on Twin Studies held in Rome, 1974, revealed that for plasma cholesterol, adult male DZ twins had a significantly larger total variance than MZ twins [2]. A similar finding was subsequently reported for newborn twins [3]. The present paper reports similar results from the Toronto Twin Register using twins of both sexes.

## METHODS

A total of 66 pairs of MZ and 26 pairs of like-sexed DZ twins were studied. These twins volunteered in response to publicity and contained a preponderance of female twins in both groups (73% of the DZ twins and 68% of the MZ twins were female).

Zygoty determinations were based on a variety of criteria. Height and weight measurements were taken and dermatoglyphic analyses performed at the time of the subjects' entry to the Register. Discordance in eye colour, hair colour or type was a first basis for assignment to fraternal classification. Beyond that, the determination of zygoty was variable depending on information gathered through various studies in which the subjects participate, ranging from the highest probability of monozygoty when placental histology was available, through ranges of multiple blood groupings and cell enzymes. However, with estimates based on varied blood cell, dermatoglyphic, and anthropometric measurements, in no case did the probability of monozygoty lie below 95%. Misclassification would introduce a slight downward bias in the estimate of genetic variance.

Blood lipids were quantitated in the Toronto Lipid Research Clinic using methods detailed in the Manual of Laboratory Operations, Lipid Research Clinics [7].

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RESULTS AND COMMENTS

The Table shows the means and mean squares for total plasma cholesterol as well as high, low, and very low-density lipoprotein cholesterol fractions. Using the method proposed by Christian and Norton [4], no significant difference was found between the MZ and DZ means for any variable studied.

Analysis of variance [1] revealed significantly greater total variance for plasma cholesterol in DZ twins ( $P = 0.03$ ) but no significant difference for triglycerides. These findings are identical to those reported by the NHLBI twin study [2]. The individual cholesterol fractions (high, low, and very low density) did not have significantly greater variance in DZ twins although the low density fraction, which makes up 60% of total cholesterol, approached significance ( $P = 0.09$ ).

The Figure shows a frequency histogram based on percentages of the MZ and DZ twins plotted as individuals. The DZ twins have a greater total variance in spite of the fact that the larger MZ group has individuals with both lower and higher cholesterol values. This finding removes the possibility that the difference in total variance is due to a few extreme values. The ultimate interpretation of this difference between members of MZ and like-sexed DZ pairs will have to take into account the fact that DZ subjects apparently differ from the general population, while the distribution of plasma cholesterol in MZ subjects closely resembles that of the general population surveyed in the same area [6] (see bottom of Figure).

There were highly significant estimates of genetic variance for all five lipid variables using the estimate obtained by subtracting the within-MZ mean square from the within-DZ mean square ( $P < 0.01$ ). This estimate is valid for triglycerides but questionable for

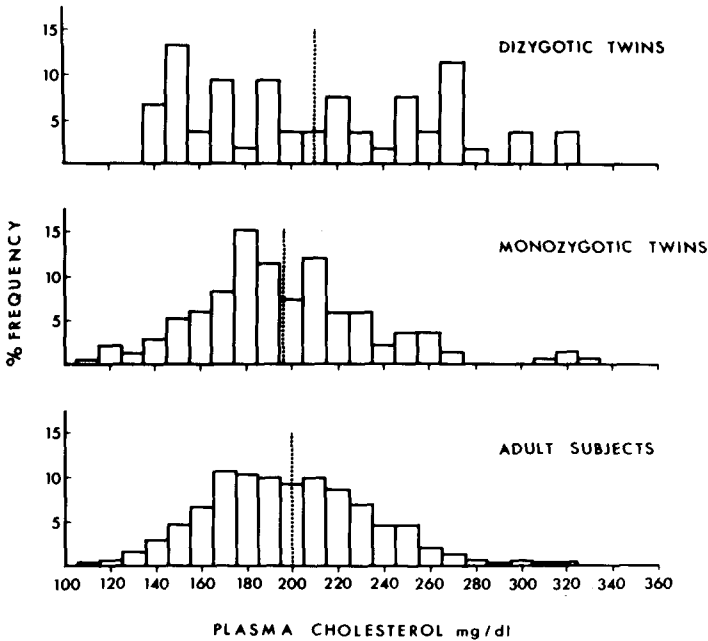


Figure. Percentage frequency distributions of plasma total cholesterol values of MZ and DZ twins from the Toronto Twin Register and of 848 adult subjects from a population study [6].

TABLE. Analysis of Variance for Plasma Lipids of 26 Like-sexed DZ and 66 MZ Pairs of Twins

Plasma fraction	Means (mg/dl)		Mean squares				Probability for F' test of total variance	Estimates of genetic variance	
	MZ	DZ	MZ		DZ			Within pair	Among component
			Among	Within	Among	Within			
Cholesterol total	197	211	2,940	315	4,511	972	0.03	657*	-457
Lipoproteins									
High density	59	60	562	70	334	270	0.44	200*	214*
Low density	122	135	2,420	271	3,311	603	0.09	332*	-280
Very low density	15	15	240	59	210	141	0.25	82*	55
Triglycerides	106	109	5,942	1,156	5,274	2,447	0.72	1,291*	979

\*P 0.01

the cholesterol fractions where there is evidence of unequal total variance in a direction that would bias upward the estimate of genetic variance using the within-pair mean squares. Of the cholesterol fractions, only high-density lipoprotein cholesterol had a significant among-component estimate of genetic variance proposed as unbiased when the total variances are unequal [1].

Because in newborn twins the variance of dichorionic MZ twins was greater than that of monozygotic MZ twins, Corey et al [5] postulated that the smaller total variance of MZ twins was due to inclusion of monozygotic MZ twins in samples of unknown placental type. However, a recent study of adult twins of known placental type reported at the Third International Congress on Twin Studies [8] found no association between placental type and variation in plasma cholesterol.

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