Serum Glycoproteins in Monozygotic and Dizygotic Twins.* (24271)

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Numerous studies have been reported concerning alterations of serum glycoproteins in pathological states. The field has recently been reviewed by Stary(1) and by Winzler (2). However, few studies(3,4,5) have dealt with the variations found in normal individuals and the factors which influence them. This study was undertaken to evaluate the effect of genetic factors on the serum glycoprotein levels.

Methods. Subjects were volunteer twins from the Oklahoma City schools and ranged from 13 to 19 years of age. A medical history was taken, fingerprints were made, and anthropometric data was recorded at the time that blood samples were taken. The twins were divided into monozygotic and dizygotic groups according to the criteria of Newman (6).

Paper strip electrophoresis studies of protein and glycoprotein were made as previously described(7). Total serum glycoprotein was quantitated by hexose determination by the tryptophan method(8). Seromucoid was isolated by the method of Weimer and Redlich-Moshin(9) and quantitated by the tryptophan method. Total serum protein was determined by the biuret reaction.

Results. Total glycoprotein hexose averaged 122 mg per 100 ml (range 98-142); seromucoid averaged 12.5 mg per 100 ml (range 10-18) for the total group. No significant difference in regard to these results was found between the monozygotic and dizygotic groups, or between either group of twins and control group of normal adults. The statistical studies of the differences between monozygotic pairs as contrasted to the differences between dizygotic pairs are summarized in Table I. In nearly all cases average differences between monozygotic pairs were found to be smaller than average differences between dizygotic pairs. However, only total glycoprotein hexose and albumin protein were significantly lower at the 1% level of significance.

Since a trend toward closer agreement between identical twins as compared to fraternal twins occurs, it would appear that the concentrations of the various serum protein and glycoprotein fractions are controlled partly by genetic factors. The genetic factors, however, would appear to be of minor importance in the normal individual at adolescence. Since inflammatory conditions, even those minor in nature, are known to have noticeable influence on the serum glycoprotein level, it may be postulated that the recent history of the individual may have more effect than the genetic factors. This postulation is borne out by the data from one pair of monozygotic twins; one twin, who had rheumatic fever 4

TABLE I. Comparison of Monozygotic and Dizygotic Twin Pairs.

Constituent	Avg difference between twins*		
	Monozygotic	Dizygotic	T value
T. protein	.22	.41	1.66
Glycoprotein hexose (mg/100 ml)	5.5	16.6	2.87†
(Glycoprotein + T. protein) × 100	.06	.16	2.18‡
Seromucoid	.8	1.5	1.20
Protein fractions			
Albumin	1.8	3.8	2.82†
α_1-globulin	.6	.4	.17
α_2- "	1.1	1.6	.38
β- "	1.1	1.3	.12
γ- "	1.8	3.2	1.94
Glycoprotein fractions			
Albumin	2.4	2.2	.30
α_1-globulin	1.7	2.4	1.10
α_2- "	2.9	4.3	1.12
β- "	1.8	2.5	.83
γ- "	2.4	2.7	.25

* Based on 13 pairs of monozygotic and 9 pairs of dizygotic twins.
† Significant at 1% level.
‡ " " 5% " .

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years previous to the study, had both a higher glycoprotein (136 v. 125 mg/100 ml) and a higher serum protein (7.74 v. 7.16). A second monozygotic pair included one twin with a history of a cold one week previous to sampling (glycoprotein 133 mg/100 ml v. 122 for the other twin).

Summary and conclusions. The influence of genetic factors on the levels of total serum glycoprotein hexose, seromucoid hexose, and the bound hexose of electrophoretic fractions were investigated by comparing the differences found between monozygotic twin pairs as contrasted to the differences between dizygotic twin pairs. The differences between total serum glycoprotein hexose of the monozygotic twin pairs were significantly lower than those found for the dizygotic twins. The quantity of hexose bound to various electrophoretic fractions was found to be closer between monozygotic than between dizygotic twins. However, these differences were not significant statistically. It may be concluded that genetic factors play a minor role in establishment of normal levels of serum protein and glycoprotein.

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Studies on Role of Liver in Nitrogen Mustard Detoxication.* (24272)

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Skipper *et al.,* who investigated the distribution of methyl-C^{14}-bis (beta-chloroethyl) amine, (HN2), in mice observed that appreciable amounts of radiocarbon were excreted in the form of carbon dioxide(1). In our laboratory similar results were obtained in rats. It was shown that only small amounts of the C^{14}-methyl group of HN2 were transferred by transmethylation mechanisms(2). Subsequent studies showed that in the microsomal fraction of rabbit and rat liver homogenates there existed an enzyme system which could readily demethylate and oxidize the labile methyl group of HN2. It also was demonstrated that such an *in vitro* preparation removed the N-ethyl group of HN2, although at a slower rate than the methyl group(3). Thus, there was a possibility that the liver, through demethylation and de-ethylation, was able to metabolize sufficient amounts of the injected drug in a short time to justify the assumption that the observed de-alkylations represented a detoxication mechanism.

This investigation was undertaken with the aim of determining how much radioisotope was excreted by the liver *via* the lymphatic and biliary systems after intravenous administration, and if these systems still contained significant amounts of cytotoxic materials. Additional studies were carried out in order to determine if preferential routing of the HN2 through the liver influenced the toxicity of the drug.

Methods. The methyl-C^{14} bis (beta-chloro-

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