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DATA TO TRANSFERRIN POLYMORPHISM IN THE SZEGED-AREA POPULATION

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Abstract: *With regard to the transferrin serum polymorphism 3 codominant alleles: Tf^C, Tf^B, Tf^D were detected at one autosomal locus by Smithies (1957) by means of starch gel electrophoresis. Isoelectric focusing revealed three suballeles, Tf^{C1}, Tf^{C2} and Tf^{C3}, within Tf^C allele (Kühnl and Spielmann 1978).*

Our studies were performed on 891 blood samples obtained from the Blood Transfusion Station of our University, taken from unrelated persons and also on the blood samples of 120 pairs of mother–and–child.

In our sample the frequency of the Tf^{C1}, Tf^{C2}, and Tf^{C3} alleles was 0.744, 0.214 and 0.042, respectively. On the basis of the frequency values the theoretical chance of excluding in paternity testing was 9.5 per cent.

Key words: *Transferrin polymorphism; Szeged-area.*

Introduction

The transferrin glycoprotein of approximative molecular weight 73000-76000 belongs to the globulin fraction of human and animal sera. It has two branching carbohydrate chains containing hexoses, acetylhexosamines, acetylneuraminic acide and fucoses. The protein part binds to the carbohydrate chain. Each transferrin molecules contain two iron-binding sites.

The transferrin are involved in iron transport and controlls the iron metabolism. The iron molecules are not covalently binded to the transferrin but are adsorbed only onto specific iron binding sites on the surface. The iron bindig capacity is pH dependent and shows a maximum stability between pH 7.2–12.00.

The genelocus is localized on the 3rd chromosome. Electrophoretically it can be separated into three fractions having different mobility. Based on this fact three genetically determinated types are known and they were first characterized by starch-gel electrophoresis by Smithies (1957).

The Transferrin-phenotypes are determined by three codominant allels the Tf^A, Tf^B and Tfc^C.

The European population belongs to the phenotype Tf^C. As its probability of theoretical exclusion of fatherhood is only 1%, it has not been applied in the ascertaintment of paternity.

The probability of theoretical exclusion of fatherhood means the number of one hundred of non-fathers who can be definitely excluded by a given procedure from the fatherhood.

By isoelectric focusing on a polyacrylamide gel Kühnl and Spielmann (1978, 1979) subdivided three suballels Tf^{C1}, Tf^{C2} and Tf^{C3} within allel Tf^C. Isoelectric focusing first applied by Svenson and Vesterberg is one of the best method to separate proteins. During isoelectric focusing we apply pH gradient between the two electrodes on the polyacrylamide gel. Due to electric current the charged proteins move to pH gradient value which corresponds to their isoelectric point. As it is given in the literature (Giblett

1969, Prokop and Geserick 1975), by isoelectric focusing of theoretical exclusion of fatherhood increases 20 times (Patzelt and Geserick 1981).

Because the attainable possibility of theoretical exclusion of fatherhood by isoelectric focusing in the transferrin system is much higher, its importance in the serological determination of fatherhood has increased.

The above results made it possible to introduce this method in our laboratory of genealogy.

Material and Method

Our investigations were made by blood samples provided by the Blood Transfusion Service of 891 randomly choosed persons who were not relatives to each other.

The determination of transferrin was made by the method of Patzelt and Geserick (1981, 1982). For isoelectric focusing ampholin (Bio-lyte) was used in pH 4–6 and pH 5–7 regions. 0.1 M glutaminic phosphoric acid served as an anod, and 0.2 M NaOH as a catod. The run was at 10 W for 3 hours. After the electrophoresis the gel was fixed in 3% sulfosalicilic acid and stained by Comassie Brilliant Blue G 250 dye for 30 minutes. The excess of dye was washed out and the plates were dried. The Tf subtypes are schematically shown on figure 1. Figure 2 shows the Tf subtypes by our investigation.

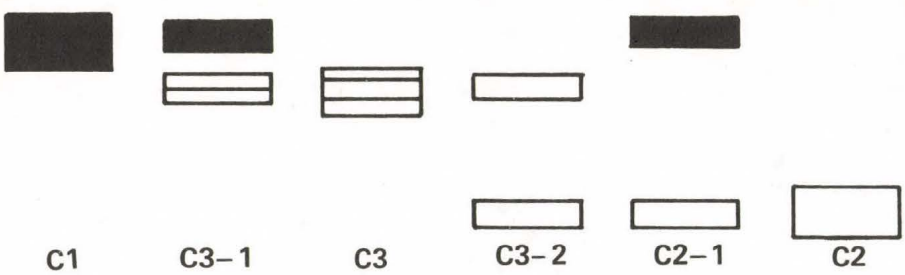

Fig. 1: Schematic representation of the transferrin subtypes according to Kühnl and Spielman (1979)

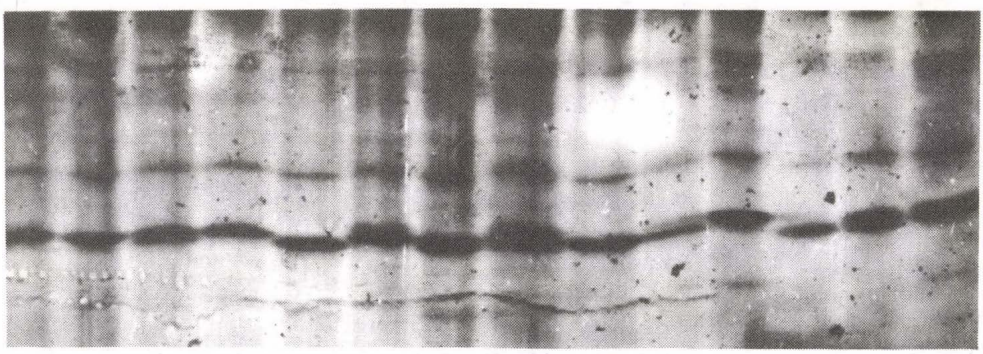

Fig. 2: Transferrin subtypes by isoelectric focusing from left to right: Tf C1; C3; C2-1; C1; C2; C3; C3-2; C3-2; C3; C3; C1; C2;

Results

Blood samples of 891 individuals from Szeged and its environs were investigated and the frequency of genes and phenotypes are summarized in table 1.

Table 1. **Distribution of the Transferrin Phenotypes and gene-frequencies in the population of Szeged area**

Phenotype	Observed n	Observed %	Calculated n	Calculated %	
C 1–1	534	59.91	539.32	60.53	
C 2–1	247	27.72	238.70	26.79	Tf^{C1} : 0.778
C 2–2	20	2.24	25.40	2.85	Tf^{C2} : 0.169
C 3–1	72	8.19	70.65	7.93	Tf^{C3} : 0.051
C 3–2	16	1.79	14.43	1.62	
C 3–3	2	0.15	2.50	0.28	
	891	100.00	891.00	100.00	

χ^2 : 1.7856 df : 2 $0.30 < P < 0.50$

According to our results the frequency of Tf^{C1} is 0.778, Tf^{C2} is 0.169 and Tf^{C3} is 0.051. These results were compared with the frequencies by other authors (Table 2).

Table 2. **Tf Gene frequencies in some other populations**

Population	Author	n	Tf^{C1}	Tf^{C2}	Tf^{C3}	Tf^{B}	Tf^{D}
West Germany							
Hessen	*Kühnl* (1980)	272	0.794	0.151	0.048	–	–
Bayern	*Weidinger* (1980)	184	0.772	0.147	0.070	–	–
East Germany							
Berlin	*Patzelt* et al. (1982)	931	0.770	0.156	0.068	0.006	–
Italy							
Padua	*Cortivo* et al. (1984)	618	0.778	0.180	0.036	0.004	0.0008
Hungary							
Ivád	*Walter* (unpublished)	112	0.827	0.094	0.079	–	–
Szeged	*Csete* et al. (1988)	891	0.778	0.169	0.051	–	–
Northwest India							
Gamit	*Walter* et al. (1983)	250	0.760	0.230	0.010	–	–
South India							
Koya	*Walter* et al. (1983)	175	0.691	0.263	0.012	–	–
Japán	*Yuassa* et al. (1987)	800	0.746	0.244	–	0.002	0.006

It can be concluded that these values does not essentially differ from the values of other people. The possibility of theoretical exclusion of fatherhood was determined by the frequency of genes and this proved to be 19.51%.

The system has not yet been applied routinly in genealogical investigations however population genetical ivestigations were done, we will use them in our practice.

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