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Gene Frequencies of Transferrin (Tf^C) Subtypes in Western Germany (Düsseldorf Region)*

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Summary. Transferrin (Tf) subtypes were determined by isoelectric focusing and polyacrylamide gelelectrophoresis on samples from 380 unrelated individuals. The following gene frequencies were observed: Tf^{C1} 0.7816, Tf^{C2} 0.1355, Tf^{C3} 0.0711, and Tf^{B} 0.0118.

Key words: Blood groups, Transferrin – Transferrin (Tf), subtypes, gene frequencies

Zusammenfassung. Die Transferrin (Tf)-Untergruppen wurden bei 380 nicht verwandten Individuen durch isoelektrische Focussierung und Polyacrylamid-Gelelektrophorese bestimmt. Die folgenden Genfrequenzen wurden beobachtet: Tf^{C1} 0,7816, Tf^{C2} 0,1355, Tf^{C3} 0,0711 und Tf^{B} 0,0118.

Schlüsselwörter: Blutgruppen, Transferrin – Transferrin-Untergruppen, Genfrequenzen

The polymorphism of human transferrin based on isoelectric focusing have been reported (Kühnl and Spielmann 1978, 1979; Kühnl et al. 1979). Using this method they demonstrated in a German population (Hessen) subtypes of the TfC corresponding to three allelic genes, Tf^{C1}, Tf^{C2}, and Tf^{C3}. Constants et al. (1980) detected recently two new alleles Tf^{C4} (Indianids) and Tf^{C5} (Black Americans). We present here the gene frequencies of Tf-subtypes in a population of Western Germany (Düsseldorf region).

Material and Methods

Serum from freshly collected blood samples without anticoagulants from 380 apparently healthy and unrelated individuals (without foreigners) were examined. Isoelectric focusing was per-

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Table 1. Distribution of Tf-subtypes in Western Germany (Düsseldorf region) and the comparison with the gene frequencies found in Hessen (Kühnl and Spielmann 1979)

Tf-genotypes	C1-1	C2-1	C3-1	C2-2	C3-2	C1-B	C2-B	C3-B	B-B	C3-3
Observed	229	86	43	5	7	7	0	0	1	2
Expected	232.14	80.49	42.24	6.98	7.32	7.01	1.22	0.64	0.05	1.92

Total: $n = 380$, $\chi^2 = 0.8572$, $0.95 > P > 0.90$, $df4$ (phenotypes with n(exp.) below 10 were combined to two groups for χ^2 calculation)

Gene frequencies:

	Tf^{C1}	Tf^{C2}	Tf^{C3}	$Tf^{B(2)}$
This paper	0.7816	0.1355	0.0711	0.0118
Kühnl and Spielmann ($n = 252$)	0.795	0.155	0.042	0.008

formed with a LKB Multiphor electrofocusing apparatus on PAG plates of 1 mm thickness, pH range 4–6.5 (LKB). The electrode paper stripes were soaked with a 2% ampholine-solution: cathode pH 6–8 and pH 4–6 for the anode, respectively. After a prefocusing time of 30 min pieces of filter paper (Whatman No. 1, 5 × 7 mm) were placed on the gel 2.5 cm from the cathodal electrode stripe and 6 µl of undiluted serum was added. An electric current was applied for 5 h; the initial voltage was approximal 380 V (limited to 1,800 V), according to about 50 mA. The power was stabilized at 20 W and the plate was cooled at 10° C.

The proteins were fixed overnight in 3.5% sulphosalicylic acid and 30% methanol, the gel then washed with destaining solution (500 ml methanol and 160 ml acetic acid diluted to 2 l with distilled water), and stained in a 0.1% solution of Coomassie Brilliant Blue R-250 in destaining solution for 30–45 min. In some cases the identification of the separated Tf bands was performed with coelectrophoresis of the same samples followed by immunofixation as described by Scheil et al. (1980) with a 1:2 diluted monospecific anti-Tf immunoglobulin (Behring AG).

With the above mentioned isoelectric focusing method the Tf B and D alleles cannot be detected. Therefore, it was necessary to separate the apparently non-heterozygote Tf C subtypes with an one-dimensional polyacrylamide gel electrophoresis according to Scheil (1973).

Results and Discussion

The transferrin subtype pattern could be revealed as distinct bands using serum samples but cannot be shown under our conditions with plasma probes. It seems possible to determine the polymorphism of the Tf C subtypes also from plasma samples by the double one-dimensional electrophoresis method as published by Altland et al. (1980). With this procedure the non-transferrin-overlapping protein bands could be separated prior to isoelectric focusing.

Table 1 summarizes our results of the transferrin subtyping in comparison with the data of Kühnl and Spielmann (1979). In our investigations we did not distinguish the different Tf B alleles. The population analysed here apparently underlies Hardy-Weinberg conditions. In comparison with the population studies in Hessen the gene frequencies are slightly but not statistical different.

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