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Gene Frequencies of Red-cell Uridine-5-Monophosphate Kinase (UMPK) in Western Germany (Düsseldorf Region)

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Summary. Uridine-5-monophosphate-kinase was determined by starch gel electrophoresis on samples of 711 unrelated individuals. The following gene frequencies were observed: $UMPK^1 = 0.9550$ and $UMPK^2 = 0.0450$.

Key words: Blood groups, UMPK-gene frequencies – Uridine monophosphate kinase, gene frequencies

Zusammenfassung. Uridin-5-Monophosphat-Kinase wurde durch Stärkegel-elektrophorese bei 711 nicht verwandten Individuen bestimmt. Die folgenden Genfrequenzen wurden beobachtet: $UMPK^1 = 0{,}9550$ und $UMPK^2 = 0{,}0450$.

Schlüsselwörter: Blutgruppen, UMPK-Genfrequenzen – Uridin-Monophosphatkinase, Genfrequenzen

Introduction

The genetic polymorphism of human UMPK was first demonstrated by Giblett et al. (1974), finding two common alleles $UMPK^1$ and $UMPK^2$ and in addition a rare one, $UMPK^3$.

Up to now there is only one report on gene frequencies for the area of South-Western Germany (Kuhn et al. 1975). Therefore we present here the gene frequencies of UMPK in a population of Western Germany (Düsseldorf region).

Material and Methods

Blood cells of freshly collected blood samples without anticoagulants from 711 apparently healthy and unrelated individuals (without foreigners) were sonified at 0° C and diluted 1:3 (v/v) with Sephadex-solution (4% Sephadex G 200, 20% Sucrose).

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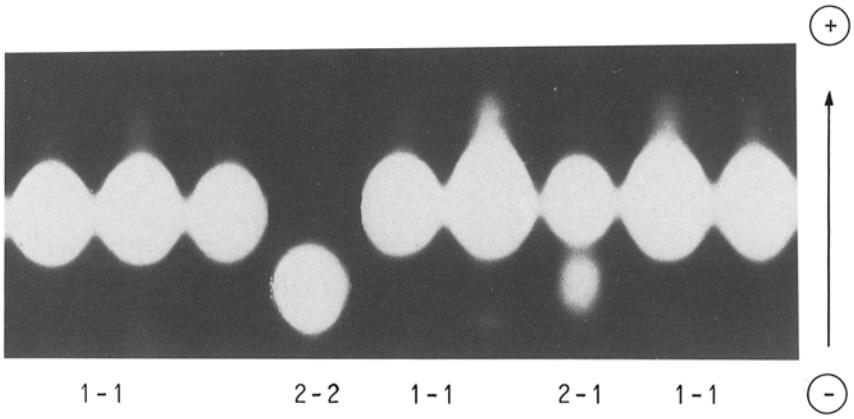

Fig. 1. Starch gel stained for UMPK after electrophoresis of human hemolysates

Table 1. Distribution of UMPK phenotypes in Western Germany (Düsseldorf region) in comparison with other gene frequencies

a UMPK-phenotypes	Observed	Expected
1	648	648.4
2-1	62	61.2
2	1	1.4

b Gene frequencies for UMPK[1]

Authors	Population	*n*	UMPK[1]
Giblett et al. (1974)	White	386	0.953
Kuhn et al. (1975)	South-Western Germany	251	0.949
Ranzani et al. (1977)	Italians	915	0.9716
This paper	Western Germany	711	0.955
Giblett et al. (1974)	Afro-American	92	0.989
	Native African	122	1.000
Giblett et al. (1974)	Cree Indian	91	0.868
Gallango and Suinaga (1978)	Warao Indians	64	0.914
	Mestizo	442	0.979
Giblett et al. (1974)	American oriental	112	0.929
Harada et al. (1975)	Japanese	635	0.9472

$n = 711$

Gel electrophoresis was performed in a 14% horizontal starch gel (w/v) using a buffer system described by Kuhn et al. (1975) at 9 V/cm for about 18 h on a cooling plate (1° C). The electrode buffer contained 0.4 *M* citric acid, 0.94 *N* NaOH, pH 5.8–6.0, while the gel buffer was 0.01 *M* histidine-HCl, 5 mM NaOH, pH 5.8–6.0. Up to 200 µl of diluted hemolysate was filled in $100 \times 100 \times 2$ mm slots. These slots were located 11 cm from the cathode.

The specific staining procedures were carried out according to the methods and with the reagents previously described by Giblett et al. (1974) and Kuhn et al. (1975).

The part of the gel belonging to the anode, 10–15 cm from the starting point, was cut into slices and incubated at 37° C for about 2–3 h between filter papers (Whatman No. 1) containing the reaction mixture.

The enzyme pattern was made visible using UV light (350 nm) before the treatment with the PMS solution (a trace of phenazine methosulfate in water) inducing the formazan reaction.

Results and Discussion

The UMPK phenotypes could be revealed as one band for the homozygote UMPK 1-1 (anodally) and UMPK 2-2 (cathodally). A two-banded pattern could be observed in the case of the UMPK 2-1, with a strong band for the $UMPK^1$ gene product and a faint band for the $UMPK^2$ gene product, as shown in Fig. 1.

Table 1 summarizes our results of the UMPK phenotype distribution in comparison with other gene frequencies for $UMPK^1$. The gene frequencies for $UMPK^1$ in Italy are slightly higher, but not statistically different (Table 1b).

A clear UMPK pattern could only be revealed under our conditions over a time period of 1–2 days, storing the hemolysates at +4° C.

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