

Frequencies of the red cell uridine-5-monophosphate kinase groups (UMPk), E.C.2.7.4.14 in Schleswig-Holstein

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In order to compare the frequencies of red cell UMPk groups in Schleswig-Holstein with the frequencies of samples of other investigators we have determined UMPk groups by starch gel electrophoresis according to GIBLETT et al. (1974) and MARTIN (1982) in a random sample of 1003 blood donors.

Table 1 shows the results. The maximum likelihood (ML) estimation of gene frequencies leads to: UMPk<sup>1</sup>: 0,9505; and UMPk<sup>2</sup>: 0,0495. The observed and expected values are in very good agreement. The rare type UMPk(3) was not observed. A small investigation of 45 pairs of parents with 104 children (table 2) shows a regular inheritance in accordance with the postulated hypothesis.

Table 1: Distribution of UMPk groups in Schleswig-Holstein

Phenotype	Number		%	ML Estimation of Gene Frequencies
	obs	(exp)		
UMPk 1	907	906,2	90,429	UMPk <sup>1</sup> : 0,9505
UMPk 2-1	93	94,4	9,272	UMPk <sup>2</sup> : 0,0495
UMPk 2	3	2,4	0,299	
Total	1003	1003,0	100,000	$\chi^2 = 0,172$ $\chi^2_{(1;0,05)} = 3,841$

Table 2: UMPk groups of 45 pairs of parents with 104 children

-Couples*-	-Children UMPk -				Total	$\chi^2$
	1	2-1	2			
No	obs(exp)	obs(exp)	obs(exp)			
1x1	24	62 (62)	--	--	62	--
1x2-1	17	12 (17)	22 (17)	--	34	2,940
1x2	1	--	2 (2)	--	2	--
2-1x2-1	3	1 (1,5)	4 (3)	1(1,5)	6	0,667
Total	45	75	28	1	104	3,607

$\chi^2 = 3,607$   $\chi^2_{(3;0,05)} = 7,815$

\* The very rare couples 2-1x2 (0,046%) and 2x2 (0,0006%) were not observed.

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As it is demonstrated in table 3 the distribution of UMPK groups in our sample does not differ from other European investigations except that of RANZANI et al. (1977) with a disproportionate low frequency of UMPK(2). Surprisingly a Japanese sample of HARADA et al. (1975) has the same distribution of UMPK groups as european samples. Since there are no significant differences between the UMPK groups of the samples in table 3 it is allowed to form a combined "European" sample and to estimate European gene frequencies (Table 3, last column): UMPK<sup>1</sup>: 0,9522, and UMPK<sup>2</sup>: 0,478.

Table 3: Comparison of UMPK groups and gene frequencies in European samples.

Author:	GIBLETT et al.	KUHN et al.	DRIESEL et al.	This Paper	Total
	(1974) *	(1975)	(1982)	(1986)	
Region:	America(White)	Western Germany	Nothern Germany		
1 obs.	351	316	648	907	2222
U (exp)	(349,2)	(318,3)	(644,8)	(909,7)	
M 2-1 obs.	33	34	62	93	222
P (exp)	(34,9)	(31,8)	(64,4)	(90,9)	
K 2 obs.	1	1	1	3	6
(exp)	(0,9)	(0,9)	(1,8)	(2,4)	
<b>Total</b>	<b>385</b>	<b>351</b>	<b>711</b>	<b>1003</b>	<b>2450</b>
	Genfrequencies				
UMPK <sup>1</sup>	0,953	0,949	0,955	0,9505	0,9522
UMPK <sup>2</sup>	0,047	0,051	0,045	0,0495	0,0478

$$\chi^2 = 0,921 \quad \chi^2_{(6;0,05)} = 12,592$$

\* The single phenotype UMPK 3-1 has not regarded.

In the other ethnical groups the gene frequencies of UMPK system differ considerably (table 4). Although the gene frequency estimation in the small samples may have great variance table 4 shows that UMPK<sup>3</sup> in europide, negride and asiatic populations does not occur or is extremely rare. Africans have obviously the highest frequency of UMPK<sup>1</sup> and Xanthoderimals of UMPK<sup>2</sup>. UMPK<sup>3</sup> has a high frequency between 0,9% and 2,3% in erythrodermal populations and Eskimos.

Table 4: UMPK groups of various ethnical groups

Author	Ethnical Group or Region	No	UMPK <sup>1</sup>	UMPK <sup>2</sup>	UMPK <sup>3</sup>
Table 3	European	2450	0,9522	0,0478	--
GIBLETT et al.(1974)	Native Africa	122	1,000	--	--
	Afro-American	92	0,989	0,011	--
RANZANI et al.(1977)	Italia,Rome,Milan	915	0,9716	0,0284	--
HARADA et al.(1975)	Japanese	635	0,9472	0,0528	--
ZARINAH et al.(1984)	India	121	0,942	0,058	--
GIBLETT et al. l.c.	American Oriental	112	0,929	0,071	--
ZARINAH et al.l.c.	Chinese	125	0,880	0,060	0,060
GALLANCO and SUINAGA (1978)	Mestizo Warao Indian	442 64	0,979 0,914	0,020 0,020	0,001 0,086
PETERSEN et al. (1985)	Eskimo,Alaska	92	0,880	0,060	0,060
GIBLETT et al.l.c.	Cree Indian	91	0,868	0,028	0,104
SCOTT and WRIGHT (1978)	Athabaskans,Alaska Yupik, Alaska Tlingits, Alaska Jnupiat, Alaska Aleuts ,Alaska	213 296 55 228 56	0,862 0,815 0,809 0,778 0,688	0,007 0,052 0,027 0,022 0,080	0,131 0,133 0,164 0,200 0,232

The chance of exclusion for nonfathers is with 4,3% higher than that of regularly or often determined systems like ADA, AK Ch<sub>1</sub>, Kell, Lewis, Lutheran, 6-GPD and Tf. However because of the expensive staining procedure and the skew distribution of the phenotypes in paternity opinions determination of UMPK should be restricted to special cases.

#### Summary

Uridine-5-monophosphate kinase (UMPK) groups were determined by starch gel electrophoresis according to GIBLETT et al. (1974) and MARTIN (1982) in a random sample of 1003 blood donors and 45 families with 104 children from Schleswig-Holstein. The results were compared with UMPK determinations of other europide samples and of many different ethnical groups. The estimated gene frequencies are UMPK<sup>1</sup>: 0,9505 and UMPK<sup>2</sup>: 0,0495. The rare type UMPK (3) was not observed. Because of the excellent agreement of the UMPK groups

in European samples it is possible to estimate European gene frequencies. There are  $UMPK^1$ : 0,9522 and  $UMPK^2$ : 0,0478. Because of the expensive staining procedure and the skew distribution UMPK determination should be restricted only to special cases of paterntity testing.

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