Z Rechtsmed (1983) 91:33–35

Zeitschrift für
Rechtsmedizin

Classification of α_2-HS-Glycoprotein (α_2HS) Types by Isoelectric Focusing

K. Umetsu, S. Kashimura, N. Ikeda, and T. Suzuki

Dept. of Forensic Medicine, Yamagata University School of Medicine, Yamagata, Japan

Summary. A sample of 300 sera from unrelated individuals from Northern Japan was examined by isoelectric focusing on polyacrylamide gels. Three common types, α_2HS 1-1, 2-1, and 2-2 were differentiated. The frequencies of the α_2HS alleles in our sample were found to be: $\alpha_2HS^1 = 0.7250$ and $\alpha_2HS^2 = 0.2750$. Analysis of 16 parents with 21 children did not show deviations from the expected mode of inheritance.

Key words: Serum groups, α_2-HS-glycoprotein (α_2HS) polymorphism – Paternity examinations, α_2HS

Zusammenfassung. Mit Hilfe der isoelektrischen Fokussierung in Polyacrylamidgelen wurden 300 Proben von nicht verwandten Personen aus Nordjapan untersucht. Es wurden drei häufige Gruppen, α_2HS 1-1, 2-1 und 2-2 differenziert. Die Allelfrequenzen in dieser Stichprobe betrugen: $\alpha_2HS^1 = 0{,}7250$ und $\alpha_2HS^2 = 0{,}2750$. Die Untersuchung von 16 Elternpaaren mit ihren 21 Kindern ergab keine Abweichung vom angenommenen autosomal kodominanten Erbgang.

Schlüsselwörter: Serumgruppen, α_2-HS-Glykoprotein-Polymorphismus – Vaterschaftsuntersuchung, α_2HS

Introduction

Schultze et al. (1962) isolated a new kind of glycoprotein from serum and named α_2-HS-glycoprotein (α_2HS). α_2HS seems to have an essential function in the opsonic effect of human leucocytes (van Oss et al. 1974) but information of its role in vivo is lacking. Naturally, we have never seen a report related to α_2HS polymorphism.

Using the technique of isoelectric focusing in polyacrylamide gel, we have examined the α_2HS in a large number of sera from unrelated individuals and from members of normal families. The results of this survey are the subject of this report.

Offprint requests to: Prof. Dr. T. Suzuki (address see above)

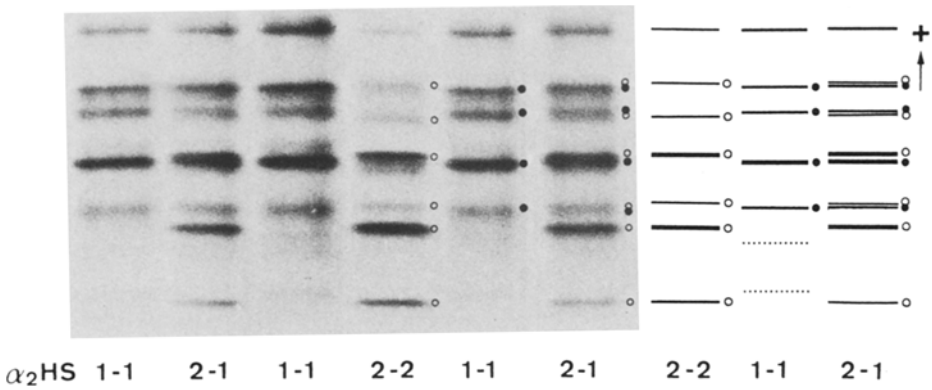

Fig. 1. Electrofocusing band patterns of the common α_2HS phenotypes. *Filled circles* indicate α_2HS^1-bands and *empty circles* α_2HS^2-bands

Materials and Methods

The sera were obtained from unrelated healthy individuals ($n=300$) and 16 families with 21 children residing in Yamagata prefecture, a northern area of Japan.

The Servalyt-containing polyacrylamide gels (230×110×0.5 mm) were prepared by mixing 2.8 ml acrylamide solution (29.1 g/100 ml), 2.8 ml N,N′-methylene bisacrylamide (0.9 g/100 ml), 1.0 ml Servalyt 4.5–5.0 (Serva), 9.8 ml distilled water, and 0.4 ml ammonium persulfate (10 mg/ml). Six-millimeter electrode strips of a thick cellulose paper (Serva) were placed at both ends of the gel. The strips were soaked in the following electrode solutions: 0.025 *M* aspartic acid and 0.025 *M* glutamic acid at the anode, and 2 *M* ethylenediamine, containing 0.025 *M* arginine and 0.025 *M* lysine, at the cathode. Isoelectric focusing was carried out at 6° C with 7 W. We allowed it to prefocus (without samples) during first 30 min. Then 3 µl of the samples were applied with filter paper (Whatman No. 3) at a distance of 1.5 cm from the cathode. After 30 min, the paper pieces were removed, and focusing was terminated after a total time of 4 h.

The immunofixation was carried out using the monospecific anti-α_2-HS-glycoprotein (Behring). A strip of cellulose acetate membrane was soaked with the antiserum and placed on the α_2HS region of the gel for 10 min. Subsequently, the strip was removed, washed 3 h with saline, and stained with Acid Violet 49 (Serva).

Results and Discussion

Figure 1 shows the band patterns of three common human α_2HS-polymorphism phenotypes electrofocused in pH 4.5–5.0 gradient. The homozygous α_2HS 1-1 and α_2HS 2-2 consist of four or six α_2HS^1- and six α_2HS^2-bands, respectively. While the heterozygous phenotype α_2HS 2-1 exhibits composite patterns of α_2HS^1- and α_2HS^2-bands.

Distribution of the observed phenotypes is given in Table 1. The estimated allele frequencies of our population sample were: $\alpha_2HS^1=0.7250$ and $\alpha_2HS^2=0.2750$. A good agreement was found between the observed and expected phenotype distributions assuming Hardy-Weinberg equilibrium condition ($\chi^2=0.24$, $df=1$, $0.5<P<0.7$).

Table 2 shows the results of family studies. The results are in agreement with an autosomal codominant mode of inheritance.

Table 1. α_2HS phenotypes and allele frequencies in the Japanese population

Phenotypes	Phenotypes		Allele frequencies
	observed	expected	
α_2HS 1-1	156	157.7	$\alpha_2HS^1 = 0.7250$
2-1	123	119.6	$\alpha_2HS^2 = 0.2750$
2-2	21	22.7	
Total	300	300.0	

Table 2. Distribution of α_2HS phenotypes in 16 families with 21 children

Phenotypes of parents	Number of mating	Number of children	Children		
			1-1	2-1	2-2
1-1 × 1-1	2	3	3 (3)	–	–
1-1 × 2-1	10	14	8 (7)	6 (7)	–
1-1 × 2-2	1	1	–	1 (1)	–
2-1 × 2-1	3	3	2 (0.75)	1 (1.5)	0 (0.75)
Total	16	21	13	8	0

Expected values are given in parentheses

From these observations the α_2HS types are determined by two alleles, α_2HS^1, and α_2HS^2. As a result of the favorable distribution of α_2HS genes in the Japanese population, this system is of high value for paternity testing. We calculated the isolated theoretic exclusion rate for this system to be 16.0%.

References

Oss CJ van, Gillman CF, Bronson PM, Border JR (1974) Opsonic properties of human serum alpha-2 HS glycoprotein. Immunol Commun 3 : 329–335

Schultze HE, Heide K, Haupt H (1962) Charakterisierung eines niedermolekularen α_2-Mukoids aus Humanserum. Naturwissenschaften 49 : 15

Received February 2, 1983