Int J Leg Med (1992) 105:81–82

International Journal of
Legal Medicine

Genetic polymorphism of human α_2HS-Glycoprotein (AHSG) in the resident population of the Basque Country (Northern Spain)

Oscar García[1] **and Antonio Alonso**[2]

[1]Sección de Biología, Laboratorio U.T. A.P., Departamento de Interior, Gobierno Vasco, c/Maria Diaz de Haro, 3-2, E-48013 Bilbao, Spain
[2]Sección de Biología, Instituto Nacional de Toxicología, Madrid, Spain

Received February 28, 1992 / Received in revised form May 15, 1992

Summary. The genetic polymorphism of human α_2HS-glycoprotein (AHSG) was studied in a sample of 466 healthy unrelated individuals resident in the Basque Country (Northern Spain) by isoelectric focusing on micro-ultrathin polyacrylamide gels followed by immunoblotting. The allele frequencies obtained were AHSG*1 = 0.7253, AHSG*2 = 0.2683 and AHSG*3 = 0.0064. These allele frequencies were compared with those reported in other European populations.

Key words: AHSG – Genetic polymorphism – Isoelectric focusing – Population study – European distribution

Zusammenfassung. Der genetische Polymorphismus des menschlichen α_2HS-Glycoprotein (AHSG) wurde in einer Stichprobe von 466 gesunden unverwandten Personen untersucht, welche im Baskenland (Nordspanien) wohnen. Die Untersuchung erfolgte mit Hilfe der isoelektrischen Fokussierung auf mikro-ultradünnen Polyacrylamid-Gelen mit nachfolgendem Immunoblotting. Die Allelfrequenzen lauten: AHSF*1 = 0.7253, AHSG*2 = 0.2683 und AHSG*3 = 0.0064. Diese Allelfrequenzen wurden mit jenen aus anderen europäischen Populationen verglichen.

Schlüsselwörter: AHSG – Genetischer Polymorphismus – Isoelektrische Fokussierung – Populationsstichprobe – Europäische Verteilung

Introduction

Although the genetic polymorphism of AHSG has been investigated in many populations, the Basque population has not yet been considered. This study describes the polymorphism of AHSG in the resident population of the Basque Country (Northern Spain). This could be of importance for forensic purposes as well as for subpopulation studies.

Materials and methods

Serum samples were obtained from 466 unrelated donors resident in the Basque Country (Northern Spain). Isoelectric focusing was carried out on miniaturized polyacrylamide gels (inter-electrode distance 55 mm) as previously described (Alonso 1988). Native samples were analyzed according to Yuasa and Umetsu (1988). The AHSG band pattern was detected by a two-step enzyme immunoassay as previously described for the detection of GC protein (Alonso 1988) using the following antibodies: rabbit anti-human AHSG followed by swine anti-rabbit immunoglobulins/HRP.

The diversity between observed and expected results has been tested using the χ^2 test for independence and genetic equilibrium according to the Hardy-Weinberg law.

Table 1. Allele frequencies of AHSG in Biscay, Guipúzcoa and Alava (Basque Country, Nothern Spain)

Population	*n*	AHSG allele frequencies		
		AHSG*1	AHSG*2	AHSG*3
Biscay	256	0.7207	0.2715	0.0078
Guipúzcoa	147	0.7279	0.2687	0.0034
Alava	63	0.7381	0.2540	0.0079

Table 2. AHSG phenotypes and gene distribution in the Basque Country (Northern Spain)

Phenotypes	*n*	Allele frequencies
1-1	249	
2-1	173	
2-2	38	AHSG*1 = 0.7253
3-1	5	AHSG*2 = 0.2683
3-2	1	AHSG*3 = 0.0064
3-3	0	
Total	466	

$\chi^2 = 1.385388$; $df = 2$; $0.60 > P > 0.50$

Table 3. Comparison between AHSG*1 and AHSG*2 allele frequencies found in the present study with those reported in other European populations

Population	Number	AHSG			Reference
		1	2	VAR	
Norway	52	0.60	0.40	–	Olaisen et al. (1981)
Denmark	?	0.63	0.36	0.008	Eiberg et al. (1984)
England	382	0.65	0.34	0.006	Westwood et al. (1987)
Germany					
Münster	168	0.62	0.38	–	Yuasa and Umetsu (1988)
Bavaria	344	0.66	0.32	0.015	Weidinger (1986)
Region of Ulm	368	0.69	0.30	0.009	Lattke and Schönberger (1988)
France	240	0.72	0.27	0.008	Robinet-Lévy et al. (1988)
Italy	199	0.76	0.24	–	Scacchi et al. (1989)
Spain					
Madrid	489	0.71	0.28	0.008	Alonso et al. (1991)
Basque Country	466	0.72	0.27	0.006	This study

Results and discussion

The allele frequencies of AHSG in the Basque resident population are shown in Table 1. The allele and phenotype frequencies in the total sample from the Basque resident population are shown in Table 2. The observed numbers are in agreement with the expectation according to the Hardy-Weinberg law.

The AHSG*1 and AHSG*2 allele frequencies determined in this study have been compared with those reported in other European populations (Table 3). The values of AHSG*1 and AHSG*2 allele frequencies are within the range of variation reported in the resident population of Madrid (Central Spain), which is the only Spanish population previously studied (Alonso et al. 1991), France (Robinet-Lévy et al. 1988) and Italy (Scacchi et al. 1989). However, the comparison with Northern European populations such as Norway (Olaisen et al. 1981), England (Westwood et al. 1987) and Germany (Yuasa and Umetsu 1988; Weidinger 1986; Lattke and Schönberger 1988) showed significant differences that should be attributed to a progressive increase of the AHSG*2 allele frequencies and the consequent decrease of the AHSG*1 allele frequencies towards the North.

In conclusion, the AHSG population data from the resident population of the Basque Country is in the range of variations of other Southern European populations and is in agreement with the suggested north-to-south AHSG genocline (Yuasa and Umetsu 1988). The AHSG*3 variant has also been confirmed in this population study.

Acknowledgements. We wish to thank Jaione Zaballa for typing the manuscript.

References

Alonso A (1988) Group specific component subtyping in bloodstains by separator isoelectric focusing in microultrathin polyacrylamide gels followed by immunoblotting. J Forensic Sci 33: 1267–1272

Alonso A, Weidinger S, Visedo G, Sancho M, Fernández-Piqueras J (1991) Genetic polymorphism of α_2HS-glycoprotein in a Spanish population. Hum Hered 41:305–308

Eiberg H, Mohr J, Nielsen LS (1984) A2HS: new methods of phenotyping and analysis of linkage relations: assignment to chromosome 3. Human Gene Mapping 7. Cytogenet Cell Genet 37: 461

Lattke H, Schönberger C (1988) α_2HS-Glycoprotein (A2HS): improved phenotyping by focusing in an immobilized pH-gradient, allele frequencies in a South German population sample and linkage data from a large pedigree. In: Mayr WR (ed) Advances in forensic haemogenetics 2. Springer, Berlin Heidelberg New York, pp 231–234

Olaisen B, Mevåg B, Teisberg P, Gedde-Dahl T Jr, Helland R, Siverts A, Jonassen R, Hjalmarsson K, Swan T (1981) Plasma protein polymorphism in two-dimensional electrofocusing/SDS electrophoresis. Proceedings of the 9th International Congress of the Society of Forensic Haemogenetics, Bern (29.9–3.10), pp 161–168

Robinet-Lévy M, Yuasa I, Umetsu K, Ikebuchi J (1988) Genetic polymorphism of α_2HS-glycoprotein in a French population. Description of two new rare variants. Hum Hered 38:174–177

Scacchi R, Lucarelli P, Corbo RM (1989) α_2HS-glycoprotein phenotype and allele distribution in continental Italy and Sardinia. Hum Hered 39:52–54

Weidinger S (1986) Isoelektrische Fokussierung und Printimmunfixation: Ein schnelles Verfahren zur Typisierung des α_2HS-Glykoproteins. In: Radola BJ (ed) Elektrophorese Forum '86. Technische Universität München, Freising-Weihenstephan, pp 156–162

Westwood SA, Seaman PJ, O'Brien C, Thorogood LJ (1987) The phenotypic frequencies of group specific component and α_2HS-glycoprotein in three ethnic groups. The use of these proteins as racial markers in forensic biology. Forensic Sci Int 35:197–207

Yuasa I, Umetsu K (1988) Genetic polymorphism of human α_2HS-glycoprotein: Characterization and application to forensic hemogenetics. Electrophoresis 9:404–410