

# APOE Gene Polymorphism in Val Di Susa and Comparison with Italian and European Populations

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## Introduction

Apolipoprotein E (APOE) is a plasma protein that plays a fundamental role in absorption, metabolism and transport of lipids in the human body. The APOE gene (APOE) is polymorphic with three common alleles, E2, E3 and E4, that encode for 3 isoforms of the protein: ApoE2, ApoE3 and APOE4 which differ from each other because of amino acid replacement in position 112 and 158.

A large amount of scientific studies reports higher levels of plasma total and LDL cholesterol in E4 carriers (compared to E2 and E3 carriers) with consequent higher risk to develop a cardiovascular disease. Moreover E4 allele is considered an important risk factor for the development of Late Onset Alzheimer Disease (LOAD).

The aim of this work was the study of the APOE gene polymorphism in a sample of adults (n=161) belonging to the alpine communities of Val Cenischia/Val di Susa and the comparison with Italian and European populations.

The subjects of both sexes belonging to family groups whose origins and settlement in their communities, going back at least three generations.

The study of the Alpine populations is of particular interest from an anthropological point of view because the processes of environmental adaptation and the geographical isolation are characteristic of human groups in the middle of last century and led to a reduction in genetic variability.

## Results

The APOE allelic frequencies in our sample (E2=0,03; E3=0,83; E4=0,14) are peculiar and significantly different from the Italian (E2=0,06; E3=0,85; E4=0,09;  $\chi^2=13,05$ ;  $df=2$ ;  $p=0,0015$ ) and Mediterranean populations. For the E4 allele frequency (0.14), the community of Val Cenischia/Val Susa are closest to Central Europe populations (France 0.12, Germany 0.14; Swiss 0.11) (Tab. 1) and differs from both Italian population (0.09) and Mediterranean populations values (Spanish 0.09, Greeks 0.07, Sardinians 0.05) (Corbo et al., 1999).

## Discussion

In Europe, the APOE allele frequencies are distributed according to a North-South geographical gradient: the lower frequencies E3 and the highest E4 are found in northern Europe, while the trend observed in Southern Europe point to exactly the opposite relationship (Fig. 1).

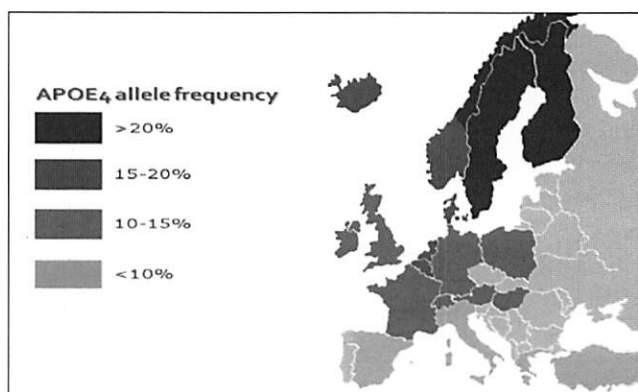


Fig. 1. The APOE4 allele frequencies in Europe (data from: Corbo et al., 1999).

In particular, the APOE4 frequencies in the Mediterranean basin's populations are the lowest in the world (Tab. 2). It is interesting the incidence of cardiovascular disease in Europe has a geographic cline like the E4 allele frequency (Müller-Nordhorn et al., 2008).

The high frequency of E4 allele in some populations, can also be explained by the Neel's theory, proposed in 1962. It shows the phenotype induced by this allelic form play a positive role in the early stages of human life.

The APOE4 metabolic dysfunction offered possibilities humans to survive during alternating periods of plenty and periods of food scarcity. These same dysfunctional transport and metabolism, guaranteed a certain store of useful substances, such as triacylglycerols, disposed in situations of food shortage.

This theory called the "thrifty genotype", has been much discussed over the years by several researchers. In societies, where there are no details of periods of famine, the dysfunctionality of the form isoproteica APOE4 appears more clearly. It shows such important relations with certain diseases. So the study of polymorphism APOE

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	Val Cenischia/ Val di Susa (n=322)	Italian (n=4000)	France (n=2456)	Swiss (n=346)
E2	0,03	0,06	0,11	0,07
E3	0,83	0,85	0,77	0,82
E4	0,14	0,09	0,12	0,11
$\chi^2$ TEST		(p=0,001)	(p<0,0001)	(p=0,005)

Tab. 1. Comparison with Italian and European populations.

European populations	E2	E3	E4
Lapps	0.050	0.640	0.310
Finnish	0.044	0.748	0.208
Swedish	0.119	0.675	0.206
Danes	0.085	0.741	0.174
Icelanders	0.068	0.767	0.165
Dutch	0.085	0.752	0.163
Belgians	0.072	0.765	0.163
Germans	0.077	0.778	0.145
UK	0.089	0.767	0.144
Norwegians	0.087	0.781	0.132
Hungarians	0.064	0.807	0.129
French	0.108	0.771	0.121
Tyroleans	0.090	0.789	0.117
Swiss	0.072	0.821	0.107
Polish	0.055	0.839	0.106
Italians	0.060	0.849	0.091
Spaniards	0.052	0.856	0.091
Turks	0.061	0.860	0.079
Greeks	0.054	0.878	0.068
Sardinians	0.050	0.898	0.052

Tab. 2. APOE gene polymorphism in European populations (data from: Corbo et al., 1999).

is not only a phylogenetic study but also an health field's relevant research.

It would be of great interest to determine whether the high frequency of E4, detected in the sample, can be confirmed in a larger sample and may correlate with a higher incidence of cardiovascular disease and senile dementia in the population.

### References

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