



Influence of the Balkan haplogroups in Europe

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Abstract: Examining the haplogroups from Eupedia [1] we conclude that two haplogroups are characteristic of the Balkans: I2*/I2a and E1b1b. The main goal of this paper is through the Balkan haplogroups to investigate the Balkan influence on countries outside the Balkans, i.e. "Balkan" connections with peoples outside the Balkans, possibly migrations from the Balkans to other European countries. We conclude that the European peoples can be divided into 4 groups: 1) Group with the highest content of "Balkan genes" - Bosnia-Herzegovina, Montenegro and Kosovo; 2) "Typical" Balkan group of countries: Serbia, Croatia, Macedonia, Bulgaria and Romania; 3) Group with "medium" Balkan genetic influence: Moldova, Greece, Ukraine, Belarus, Slovenia, Hungary, Slovakia; 4) Group with "weak" Balkan genetic influence: all other European countries.

Key words: haplogroups, multidimensional model, genetic distances, genetic proximity, Balkan haplogroups.
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I. Introduction:

DNA analysis is a well-established scientific method that is becoming increasingly widespread in practice. Recently, the attention of both the general public and specialists has been directed to its combination to solve other problems - for example, with the accumulation of data from genetic studies of individual individuals, a naturally formed interest in the "genetic" relationships between groups of people ("populations"), and peculiarities between peoples; a "genetic" connection was sought between individual peoples and their common roots; attempts were made to trace possible movement ("resettlement") of peoples; there is a defined "genetic distance" between peoples.

Research in this area has been done for a long time; among those publications that are relatively directly related to our analyses and results presented below, we will mention [2], [3], [4], [5], [6], [7], [8] and [9].

Examining the haplogroups from Eupedia [1] it is established that two haplogroups are characteristic of the Balkans: I2*/I2a and E1b1b. Tables of data on their quantitative distribution among European peoples (in percentages) are presented in Table 1 and Table 2, respectively, and maps of their distribution among European peoples are shown in Fig.1 and Fig.2; darker colored sides have more genes from the corresponding haplogroups.

Region/Haplogroup	I2*/I2a	Region/Haplogroup	I2*/I2a
Albania	12	Latvia	1
Austria	7	Lithuania	6
Belarus	17.5	Macedonia	23
Belgium	3	Malta	10
Bosnia-Herzegovina	50.5	Moldova	21
Bulgaria	20	Montenegro	29.5
Croatia	37	Netherlands	1
Cyprus	4	Norway	0
Czech Republic	8.5	Poland	5.5
Denmark	2	Portugal	1.5
England	2.5	Romania	28
Estonia	3	Russia	10.5
Finland	0	Scotland	1
France	3	Serbia	34
Germany	1.5	Slovakia	16
Greece	9.5	Slovenia	20.5
Hungary	16	Spain	4.5
Iceland	0	Sweden	1.5
Ireland	1	Switzerland	1.5
Italy	3	Turkey/Anatolia	4
Kosovo	2.5	Ukraine	20.5
		Wales	1

Table 1. Distribution of the quantity (in percentages) of the "Balkan" haplogroup I2*/I2a in Europe [1].

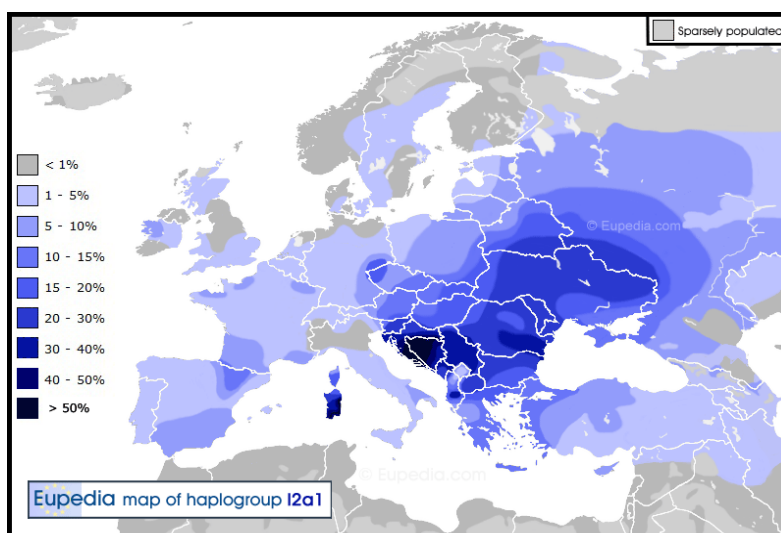


Fig.1. Map of the quantitative distribution of haplogroup I2*/I2a among European peoples from EUPEDIA [1].

Region/Haplogroup	E1b1b	Region/Haplogroup	E1b1b
Albania	27.5	Latvia	0.5
Austria	8	Lithuania	1
Belarus	4	Macedonia	21.5
Belgium	5	Malta	9
Bosnia-Herzegovina	11.5	Moldova	13
Bulgaria	23.5	Montenegro	27
Croatia	10	Netherlands	3.5
Cyprus	24.5	Norway	1
Czech Republic	6.5	Poland	3.5
Denmark	2.5	Portugal	14
England	2	Romania	14
Estonia	2.5	Russia	2.5
Finland	0.5	Scotland	1.5
France	7.5	Serbia	15
Germany	5.5	Slovakia	6.5
Greece	21	Slovenia	5
Hungary	8	Spain	7
Iceland	0	Sweden	3
Ireland	2	Switzerland	7.5
Italy	13.5	Turkey/Anatolia	11
Kosovo	47.5	Ukraine	6.5
		Wales	4

Table 2 Distribution of the amount (in percentages) of the "Balkan" haplogroup E1b1b in Europe [1].

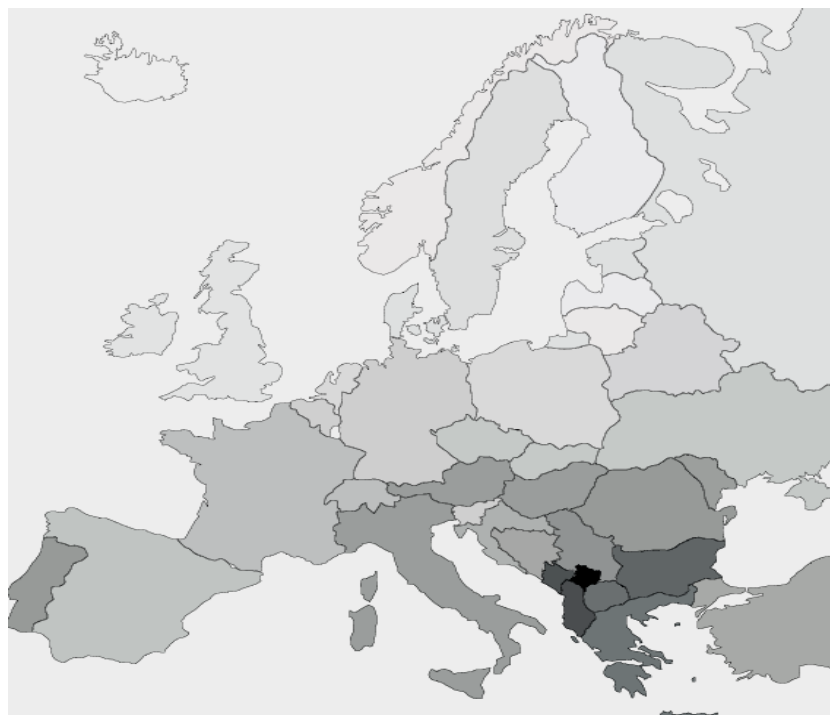


Fig.2. Map of the quantitative distribution of haplogroup E1b1b among European peoples. The map was built by G. Gachev based on data from the article [2].

Region/Haplogroup	E1b1b	Region/Haplogroup	E1b1b
Albania	27.5	Latvia	0.5
Austria	8	Lithuania	1
Belarus	4	Macedonia	21.5
Belgium	5	Malta	9
Bosnia-Herzegovina	11.5	Moldova	13
Bulgaria	23.5	Montenegro	27
Croatia	10	Netherlands	3.5
Cyprus	24.5	Norway	1
Czech Republic	6.5	Poland	3.5
Denmark	2.5	Portugal	14
England	2	Romania	14
Estonia	2.5	Russia	2.5
Finland	0.5	Scotland	1.5
France	7.5	Serbia	15
Germany	5.5	Slovakia	6.5
Greece	21	Slovenia	5
Hungary	8	Spain	7
Iceland	0	Sweden	3
Ireland	2	Switzerland	7.5
Italy	13.5	Turkey/Anatolia	11
Kosovo	47.5	Ukraine	6.5
		Wales	4

Table 2 Distribution of the amount (in percentages) of the "Balkan" haplogroup E1b1b in Europe [1].

Our main goal is through the Balkan haplogroups to investigate the Balkan influence on countries outside the Balkans, i.e. "Balkan" connections with peoples outside the Balkans, possibly migrations from the Balkans to other European countries. The main indicator of this influence is the distribution (in percentages) of the total (summary) amount of the two "Balkan" haplogroups I2*/I2a and E1b1b in Europe: it is presented in Table 3, and its visualization is shown on the map in Fig.3.

Region/Haplogroup	I2I2a+E1b1b	Region/Haplogroup	I2I2a+E1b1b
Albania	39.5	Latvia	1.5
Austria	15	Lithuania	7
Belarus	21.5	Macedonia	44.5
Belgium	8	Malta	19
Bosnia-Herzegovina	62	Moldova	34
Bulgaria	43.5	Montenegro	56.5
Croatia	47	Netherlands	4.5
Cyprus	28.5	Norway	1
Czech Republic	15	Poland	9
Denmark	4.5	Portugal	15.5
England	4.5	Romania	42
Estonia	5.5	Russia	13
Finland	0.5	Scotland	2.5
France	10.5	Serbia	49
Germany	7	Slovakia	22.5
Greece	30.5	Slovenia	25.5
Hungary	24	Spain	11.5
Iceland	0	Sweden	4.5
Ireland	3	Switzerland	9
Italy	16.5	Turkey/Anatolia	15
Kosovo	50	Ukraine	27
		Wales	5

Table 3. Distribution of the total amount (in percentages) of the two "Balkan" haplogroups I2*/I2a and E1b1b in Europe.

The data in Table 3 show that with the highest percentage of the total (summary) amount of the two "Balkan" haplogroups I2*/I2a and E1b1b in Europe: - 62% - is Bosnia-Herzegovina; with a high percentage of such genes are also Montenegro - 56.5%, Kosovo - 50%, Serbia - 49%, Croatia - 47%, Macedonia - 43.5%, Bulgaria - 43.5%, Romania - 42%.

On the map in fig.3 the first three countries of this list are colored with the darkest color, the remaining three – with a lighter one. Countries with a percentage of "Balkan" genes between 0% and 20% - with the lightest color.

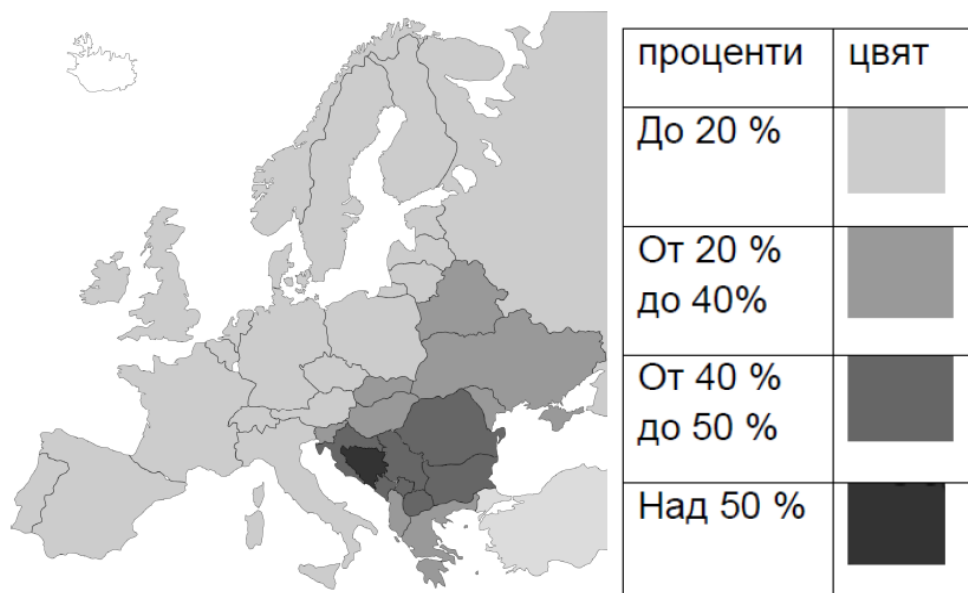


Fig.3. Map of the total amount of the two "Balkan" haplogroups I2*/I2a and E1b1b in Europe: the darker colored countries have a higher amount of genes from these haplogroups.

The four different map colors in Fig.3 enable the European peoples to be divided into 4 groups:

- 1) Group with the highest content of "Balkan genes" - Bosnia-Herzegovina, Montenegro and Kosovo;
- 2) "Typical" Balkan group of countries: Serbia, Croatia, Macedonia, Bulgaria and Romania;
- 3) Group with "medium" Balkan genetic influence: Moldova, Greece, Ukraine, Belarus, Slovenia, Hungary, Slovakia,
- 4) Group with "weak" Balkan genetic influence: all other European countries.

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