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Y chromosome SNP haplogroups in Danes, Greenlanders and Somalis

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Abstract. We have developed a PCR-based assay with co-amplification of 25 DNA fragments and detection of 35 Y chromosome SNPs with the SNaPshot technique. The Y SNP package can define 34 Y chromosome haplogroups and it can identify the majority of the Y chromosome haplogroups of interest in the populations relevant to forensic genetics in Denmark. We typed 194 Danes, 215 Greenlanders, and 201 Somalis, all males. A total of 21 different haplogroups were identified. In Danes, 11 haplogroups with frequencies from 0.5% to 38% were identified and three of the haplogroups, I, R1b*(xR1b1, R1b6, R1b8) and R1a1*(xR1a1b), were found in ~91% of the population. In Greenlanders, 10 haplogroups with frequencies from 0.5% to 50% were identified and the haplogroups P*(xQ3a, R1), R1b*(xR1b1, R1b6, R1b8) and I, were found in ~86% of the population. In Somalis, 14 haplogroups with frequencies from 0.5% to 79% were identified and the haplogroups E3b1*(xE3b1b) and K*(xN3, O, P) were found in ~88% of the population. The distribution of haplogroups was compared to the distribution found in 65 males from West Africa.

Keywords: Y chromosome; Single nucleotide polymorphism; Multiplex PCR; Minisequencing

1. Introduction

We have developed a multiplex PCR with 25 amplicons containing 35 known Y chromosome SNPs, and we have used the SNaPshot assay to detect all 35 SNPs in a single experiment [1]. We selected Y chromosome SNPs that were reported to be polymorphic in European and other populations relevant to forensic genetics in Denmark [2]. Here, we compare the haplogroup diversity in Somali, Danish and Greenlandic males using the 35 SNP package. These populations include Y haplogroups typically found in African and Eurasian populations.

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2. Materials and methods

DNA samples from unrelated males (number of individuals are given in parenthesis) from Somalia (201), Greenland (215), Denmark (194) and a total of 65 Western Africans from Mali (38), Ghana (16), Mauritania (3), Guinea Conakry (2), Liberia (2), Côte d'Ivoire (1), Guinea–Bissau (1), Senegal (1), and Cameroon (1), were typed for 35 SNPs.

The PCR amplification, SNaPshot reaction and SNP typing was performed as previously described [1]. The relevant portion of the YCC tree is shown in Fig. 1.

3. Results

The genealogical relationship of the haplogroups and their relative frequency is shown in the Fig. 1. In Danes, 11 haplogroups with frequencies from 0.5% to 38% were identified

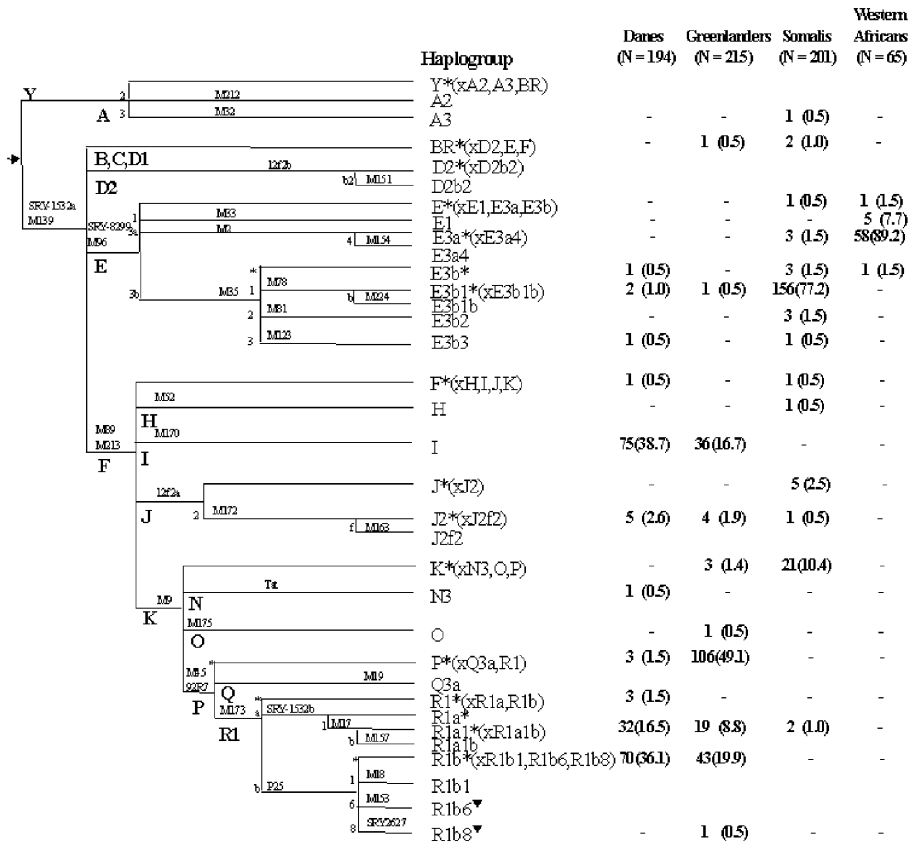

Fig. 1. Phylogenetic distribution of the 34 Y chromosome haplogroups that can be detected by the 35 biallelic markers. On the right is shown the distribution of Y chromosome haplogroups in Danes, Greenlanders, Somalis and people from West Africa. The relative frequency in percent is shown in parentheses. (ψ) The haplogroups R1b6 and R1b8 have been described as R1b3d and R1b3f in the new YCC tree 2003 [3].

and three of the haplogroups: I (38.7%), R1b*(xR1b1, R1b6, R1b8) (36.1%) and R1a1*(xR1a1b) (16.5%), were identified as the most abundant in this population. In Greenlanders, 10 haplogroups with frequencies from 0.5% to 50% were identified and the haplogroup P*(xQ3a, R1) (49.1%) was the most frequent followed by R1b*(xR1b1, R1b6, R1b8) (19.9%) and I (16.7%), which are characteristic of male Europeans.

In Somalis, 14 haplogroups with frequencies from 0.5% to 79% were identified and two of the haplogroups were found in 90% of the population: E3b1*(xE3b1b) (77.2%) and K*(xN3, O, P) (10.4%). In contrast, among the Western Africans, E3b1 was never observed. The most frequent haplogroup in West Africa was E3a (89%) (Fig. 1).

4. Discussion

Haplogroup P*(xQ3a, R1), found in almost 50% of males from Greenland, was also found in high frequencies among the North Americans and Siberian Inuits [4]. In contrast, the other three major haplogroups found in Greenland (haplogroup I, R1a1 and R1b) are found in high frequencies in the Danish population. This substantiates the notion that almost 50% of the male Greenlanders are of European (Nordic) descent [5] and that the other half may originate from Siberian and North American Inuits.

The Somali population have the highest frequency of the Y chromosome haplogroup E3b1* (79%) ever reported. Unfortunately, there are very few reports containing results from the subclades to E3b in the literature. However, the highest haplogroup frequencies reported for E3b is around 25% observed in Albanian, Greek, Lebanese and Ethiopian populations [2].

The haplogroup distributions found in the four different populations in this study are very different, demonstrating the efficiency of the 35 SNP package to separate various population groups.

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