



Forensic evaluation of 27 y-str haplotypes in a population sample from Nigeria

B. Martinez^{a,*}, L. Catelli^b, M. Romero^b, V.O. Okolie^c, S.O. Keshinro^d, E.F. Carvalho^e, C. Vullo^b, L. Gusmão^{e,f}

^a Molecular Genetics Lab., Institute for Immunological Research, University of Cartagena, Cartagena, Colombia

^b DNA Forensic Laboratory, Argentinean Forensic Anthropology Team (EAAF), Córdoba, Argentina

^c Molecular Biology Research Laboratory, Lagos University Teaching Hospital (LUTH), Lagos, Nigeria

^d FCIID Annex, Nigeria Police Force, Lagos, Nigeria

^e DNA Diagnostic Laboratory (LDD), State University of Rio de Janeiro (UERJ), Brazil

^f IPATIMUP, Institute of Pathology and Molecular Immunology from University of Porto, Portugal

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ABSTRACT

Nigeria is a country located in Gulf of Guinea, in West Africa, facing the Atlantic Ocean. It is one of the most populous country in the world. There are more than 500 ethnic groups inhabiting the territory, representing a high diversity of languages and cultures. In this study, we collected 142 samples from the three largest ethnic groups in Nigeria: Hausa, Igbo and Yoruba. These samples were typed for the 27 Y-STR loci included in the Yfiler[®] Plus kit. A total of 140 different haplotypes were found, with two haplotypes shared by 2 individuals. The haplotype diversity was 0.9998 (± 0.0009), slightly higher than that obtained with the 17 Y-STRs from the Yfiler kit (0.9992 ± 0.0010). The Yfiler kit also showed an increased number of shared haplotypes, with 4 being shared by 2 individuals and one by 3. The average gene diversity over loci was lower in Nigeria than in the U.S. population groups reported in Yfiler[®] Plus kit User Guide. The DYS391, DYS390, DYS438, DYS392, DYS437 and DYS533 showed low diversity values ($GD \leq 0.35$). Comparisons between Nigeria and five populations in East Africa, the only African data available for the Yfiler[®] Plus markers, revealed significant differences among all populations (p -values $\ll 0.00005$). The smallest F_{ST} was found with Kenya ($F_{ST} = 0.025$), followed by Ethiopia ($F_{ST} = 0.105$). As expected, distances with Djibouti, Eritrea and Somalia were higher than 20%, since our sample are from Bantu speakers, not represented in these population sample.

1. Introduction

Nigeria is a country located in Gulf of Guinea, in West Africa, facing the Atlantic Ocean. It is one of the most populous country in the world. There are more than 500 ethnic groups inhabiting the territory, representing a high diversity of languages and cultures [1]. This has made it difficult to know their genetic relationships and at the same time to establish forensic and human identification databases even today for this African region. In this study, we collected samples from the three largest ethnic groups in Nigeria: Hausa, Igbo and Yoruba to evaluate Y-STR haplotypes since they are an efficient tool in forensic and population genetics included in the Yfiler[®] Plus Kit [2,3]. 17 Y-STRs widely used loci included in the Yfiler[®] Kit (Applied Bio systems, USA) are included in this kit, besides 10 new additional YSTR loci (DYS481, DYS460, DYS533, DYS449, DYS576, DYS627, DYS518,

DYS570, and DYF387S1a/b), with the last seven being rapidly mutating Y-STRs (RM Y-STRs).

2. Materials and methods

142 individuals belonging to three largest ethnic groups in Nigeria: Hausa, Igbo and Yoruba (Fig. 1.) were collected under informed consent and the DNA was extracted from bloodstain using standard phenol/chloroform extraction procedure or Chelex solution. PCR amplification was carried out on a Gene Amp PCR System 9700 Thermal Cycler (Applied Bio systems, USA) according to the manufacturer's recommendations using the Yfiler[®] Plus Amplification Kit.

Electrophoresis and STR genotyping were performed in an ABI 3500 Genetic Analyzer (Applied Biosystems, USA). Allele

* Corresponding author at: University of Cartagena, Cartagena, Colombia.

E-mail address: bmartinezal@unicartagena.edu.co (B. Martinez).

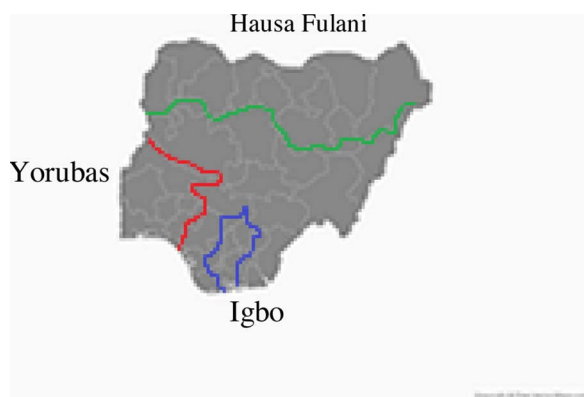


Fig. 1. Graphic representation of the population sample location of Nigeria, Africa.

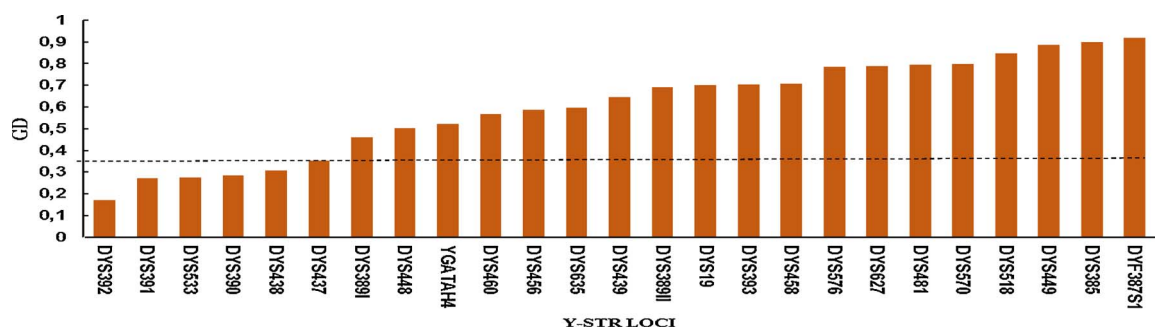


Fig. 2. The genetic diversities of the loci typed with Yfiler1 Plus. Broken lines represent genetic diversity $\leq 0,35$.

diversity values ($GD \leq 0.35$). Comparisons between Nigeria and five populations in East Africa [6], the only African data available for the Yfiler® Plus markers, revealed significant differences among all populations (p -values $\ll 0.00005$). The smallest F_{ST} was found with Kenya ($F_{ST} = 0.025$), followed by Ethiopia ($F_{ST} = 0.105$). As expected, distances with Djibouti, Eritrea and Somalia were higher than 20%, since our sample are from Bantu speakers, not represented in these population sample. Fig. 3.

In conclusion, this study represents the first report of haplotype frequencies for the Yfiler® Plus markers' set in the Nigeria population will provide the forensic community information to perform statistical calculations using this new kit.

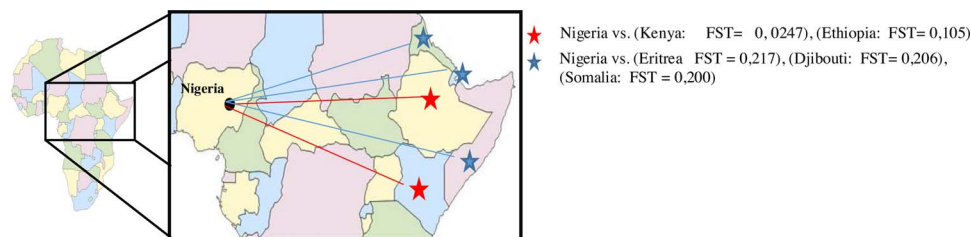


Fig. 3. Population Pairwise F_{ST} s. between Nigeria with other African populations [7]. $P \ll 0,00005$.

designations were made using the allelic ladders provided with the Yfiler Plus kit using GeneMapper software. The Authors followed ISFG recommendations for the analysis of the polymorphisms [3]. Genetic diversities (GD) and Haplotype frequencies were calculated according to Nei [4] using the Arlequin software ver. 3.5.1.3 [5]. These data were used to compare the Nigeria populations with other African populations (F_{ST}) that had been previously typed with the same multiplex, which required all haplotypes with null and intermediate alleles to be removed.

3. Results and discussion

A total of 140 different haplotypes were found, with two haplotypes shared by 2 individuals. The haplotype diversity was 0.9998 (± 0.0009), slightly higher than that obtained with the 17 Y-STRs from the Yfiler kit (0.9992 ± 0.0010). Fig. 2. The Yfiler kit also showed an increased number of shared haplotypes, with 4 being shared by 2 individuals and one by 3.

The average gene diversity over loci was lower in Nigeria than in the U.S. population groups reported in Yfiler® Plus kit User Guide. The DYS391, DYS390, DYS438, DYS392, DYS437 and DYS533 showed low

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Conflict of interest

none.

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