**Topic:** GENETIC ANALYSIS OF 27 Y-CHROMOSOME SHORT TANDEM REPEAT

(Y-STR) LOCI OF THE ZIMBABWEAN SHONA ETHNIC GROUP.

**BY:** MANDIPA SHONHAI

**Faculty:** SCIENCE

Thesis Submitted in Partial Fulfilment of the Requirements of a Master’s in Forensic Science Degree (MPhil), Biological Sciences Department, University of Zimbabwe

January 2021

**Principal supervisor:** Prof. Tamuka Nhiwatiwa (Department of Biological Sciences,

University of Zimbabwe)

**Co-supervisors:** Dr. Tshifhiwa Nangambi (Department of Nature Conservation,

Tshwane University of Technology) & Dr Sungai Mazando (Department of Biological Sciences, University of Zimbabwe)

ABSTRACT

Population genetic data about modern DNA profiles, specifically for Zimbabweans, was almost non-existent aside from that of 55 individuals’ DNA profiles contributed on the YHRD international database, under accession number YA003884. The aim of this research was to bridge the gap by the addition of this type of data for the Shona ethnic group from Zimbabwe. From 373 voluntary participants located in Harare province initially recruited under this research study, only 200 unrelated Zimbabwean males were considered for genetic population data due to the limitation of the analysis kit used. Epithelial cell samples from the inner side of the participants’ cheeks were taken and processed to produce each individuals Y-chromosomal DNA profile. Thirty-six of the same type of samples known as buccal swabs were utilised for a separate pilot study analysing related Zimbabwean Shona males. A 5-dye SureID® 27Y Human STR Identification Kit was used to perform multiplex polymerase chain reactions (PCR) and generate these Y-chromosomal DNA profiles for each participant from the unrelated and related Zimbabwean Shona male studies. This kit targets markers DYS456, DYS576, DYS570, DYS481, DYF387S1, DYS627, DYS393, DYS391, DYS390, DYS635, DYS449, DYS533, DYS438, DYS389I, DYS448, DYS389II, DYS19, GATA-H4, DYS518, DYS458, DYS460, DYS437, DYS439, DYS392, and DYS385, similar to the Yfiler® Plus Amplification Kit, another popular kit used to generate Y-chromosomal DNA profiles. Under the unrelated males’ genetic analysis, a total of 161 Y-chromosomal DNA profiles were generated with the PowerPlex® Y system which looks at 12 out of the 25 above markers, whereas 159 were generated for the Yfiler® Plus system (targets all 25 marker). The ratio of the number of unique DNA profiles to the total number of DNA profiles observed known as the Haplotype Discrimination Capacity (DC) with the Yfiler® Plus system was determined to be 0.9686. While the Genetic Diversity (GD) or variation in the genetic composition of the targeted marker ranged from 0.03748 at DYS392 with the least, to 0.867239 at DYS449 with the highest. One DNA profile or haplotype contained the triallelic pattern 37, 38, and 39 at DYF387S1. One marker, DYS448 was blank (had a null allele) in nine of the 159 DNA profiles, while microvariant alleles (alleles with decimal points) were seen in 13 of these DNA profiles. Pairwise genetic distances between this study population compared with data sets of 22 reference African populations as well as 51 reference non-African populations’ data sets showed significant genetic variation with the Shona population and each reference population. For the preliminary investigation of the individualizing capacity of the SureID® 27Y Human STR Identification Kit with Shona male brother pairs, 36Y-chromosomal DNA profiles were generated with the same procedure as for unrelated males. Of the 18 brother pairs analysed, 22.2% were distinguishable from each other at one maker, either marker DYS481, DYS393, DYS458 or DYS518. Variation at makers DYS518 and DYS481 could be explained by previously reported high genetic diversity for Shona unrelated males. Whereas, variation at makers DYS393 and DYS458 could be explained by their relatively smaller PCR products which resulted in detectable small changes in the DNA profiles. In addition, an identical DNA profile was reported for four brother pairs (P14, P15, P17 and P18). The shared DNA profile observed suggested relatedness probably via common ancestors. Brother pair P17 and P18 shared the same totems or clan “*Moyo*” while P15 with the “*Shava*” totem might be explained by the common ancestry from the “*Mbire*” lineage. Taken as a whole, the findings from this research provided much needed insight on the DNA profiles observed for Zimbabweans of Shona origin and subsequently gave information on this population’s genetics. It provided statistical parameters based on the unrelated males which are crucial for proper statistical calculations in human identification work which looks at Shona males. While it also highlighted the possible limitations and strengths of the SureID® 27Y Human STR Identification Kit when used for human identification which may involve related Shona males.