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Polymorphism studies of ten non-CODIS (Combined DNA Index System) mini-STR loci for three ethnic populations in Sri Lanka

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Mini STRs have emerged as a useful tool in the analysis of degraded DNA in forensic evidence. Prior to being used for forensic purposes, it is necessary to determine the suitability of such DNA markers for the given population and establish STR allele frequencies which can be used in the calculation of the probability of a random match between two identical mini-STR profiles. The objective of this study was to determine the suitability of a panel of ten autosomal mini-STR loci namely D1S1677, D2S1776, D10S1248, D11S4463, D12SATA, D14S1434, D17S974, D18S853, D20S482 and D22S1045 through the establishment of a population database. These mini-STRs were selected from twenty six mini-STR loci published by National Institute of Standards (NIST), USA. Blood samples obtained from 278 unrelated healthy adult individuals comprising Sinhalese, Sri Lankan Tamils and Sri Lankan Moors were used to generate population data for the ten mini-STR loci and determine forensically important parameters such as polymorphic information content (PIC), heterozygosity (OH) and typical paternity index (PI). The maximum length of amplified fragments of the mini-STR loci analyzed was found to be less than 120 base pairs in size except D2S1776, which extended to 161 base pairs. The STR loci D1S1677, D2S1776, D10S1248, D11S4463, D12SATA and D14S1434 showed a relatively high degree of polymorphism with observed heterozygosities >0.7 for the three ethnic groups analyzed whereas STR loci D17S974, D18S853, D20S482 and D22S1045 showed a moderate degree of polymorphism with the observed heterozygosities >0.6 . Nine out of ten mini-STR loci did not show any departure from the Hardy–Weinberg equilibrium for all the three populations tested whereas D20S482 conformed with HW expectations only after the application of a Bonferroni correction. The power of discrimination for the ten STR loci was found to be 0.9999964 for the three Sri Lankan populations tested. The frequency of occurrence of alleles of these mini-STR loci for the tested population has also been established and is available for the calculation of match probabilities in forensic casework in Sri Lanka.

The population genetic evaluation of these ten mini-STR loci on the Sri Lankan population will enable the use of these mini-STRs as a supplement to the existing conventional STR system where additional STR loci are required to provide greater discrimination or to be used as a stand-alone system for the analysis of highly degraded DNA evidence.

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