Forensic applicability of the Y-chromosome specific STRs with special reference to complex rape cases

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Autosomal hypervariable genetic markers such as mini and microsatellite or short tandem repeats (STRs), proved to be excellent tools for personal identification and paternity testing. However, a set of Y-chromosome specific STRs was recently investigated as part of a multilaboratory study describing the genetic attributes of these markers in a worldwide population sample. Then, a collection of forensic samples was tested in order to validate its applicability in forensic casework. The results obtained led us to select the single band pattern generating STRs as the most suitable for typing evidentiary material. At present, a total 278 cases were investigated using these Y STRs as part of our molecular arsenal of hypervariable DNA markers. The distribution of cases requiring paternal lineage determination was as follows: 40.7% complemented paternity tests, 6.8% post-mortem paternity testing, 22.3% trace typing for suspect identification, 30.2% rape cases. In this work we describe two complex rape cases that could be clarified with the help of the Y STRs.

Case 1: A young woman was raped and killed in a small town of Argentina. Evidentiary material was typed by using a complete battery of Y and autosomal STR markers. Five suspects were typed and excluded with Y-STRs, an additional fourteen suspects were then analyzed and only one of them displayed the Y haplotype initially detected in the evidence swabs, whose frequency in our population was <0.03. Results were confirmed by complete autosomal STR markers attaining a LR=6.3×10^8.

Case 2: In a multiple rape case a collection of evidence was analyzed. The Y-specific pattern obtained strongly suggested that at least two men had participated in the crime. Autosomal STR typing results depicted multi allele patterns. Nevertheless, combined male specific patterns clearly excluded both suspects.