Next-Generation STR Genotyping Kits for Forensic Applications

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ABSTRACT: Forensic DNA typing has been a constantly evolving field driven by innovations from academic laboratories as well as kit manufacturers. Central to these technological advances has been the transition from multilocus-probe restriction fragment length polymorphism (RFLP) methods to short tandem repeat (STR) PCR-based assays. STRs are now the markers of choice for forensic DNA typing and a wide variety of commercial STR kits have been designed to meet the various needs of a forensic lab. This review provides an overview of the commercial STR kits made available since the year 2000 and explains the rationale for creating these kits. Substantial progress has been made in key areas such as sample throughput, speed, and sensitivity. For example, a significant advancement for databasing labs was the capability of direct amplification from a blood or buccal sample without need for DNA extraction or purification, enabling increased throughput. Other key improvements are greater tolerance for inhibitors (e.g., humic acid, hematin, and tannic acid) present in evidence samples, PCR cycling times decreased by 1–1.5 h, and greater sensitivity with improved buffer components and thermal cycling conditions. These improvements that have been made over the last 11 years have enhanced the ability of forensic laboratories to obtain a DNA profile from more challenging samples. However, with the proliferation of kits from different vendors the primer binding sequences of the loci vary, which could result in discordant events that would need to be resolved either via a database-driven software solution or simply by evaluating discordant samples with multiple kits.

KEY WORDS: DNA typing, genotyping, human identification, mini-short tandem repeat, miniSTR, short tandem repeat, STR, X-STR, Y-STR.