

SHORT TANDEM REPEAT (STR) MULTIPLEX SYSTEMS

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Short tandem repeat (STR) polymorphisms are becoming the standard genetic markers used throughout the world for development of forensic databases. In the United States, the Federal Bureau of Investigation (FBI) has selected 13 specific STR loci to be used as the core for development and application of the national database, the Combined DNA Indexing System (CODIS). In Europe the organizations of Interpol, ENFSI, and the Forensic Science Service (FSS) of the United Kingdom have selected or are selecting various sets of preferred STR loci. We will describe our recent and future strategies to develop STR multiplexes to meet the needs of these various organizations.

The STR loci have been well characterized and allelic ladders have been or are being constructed for each locus. The multiplex systems using these loci are in various stages of development in our laboratory. Systems are being developed for use with a variety of detection instruments. Formats will be developed for use with the ABI PRISM® 310 Genetic Analyzer and ABI PRISM® 377 DNA Sequencer, and for use with the Hitachi FMBIO® II Fluorescent Scanner.

We have developed the *GenePrint® PowerPlex™ 1* System which combines amplification of 8 STR loci (CSF1PO, TPOX, TH01, vWA, D16S539, D7S820, D13S317, and D5S818) and the gender identification locus, Amelogenin, in a single amplification reaction. We will also describe development of a second system, the *GenePrint™ PowerPlex™ 2.1* System (Penta E, TPOX, TH01, vWA, FGA, D3S1358, D8S1179, D18S51, and D21S11) for use with the Hitachi FMBIO® II Fluorescent Scanner which contains the remaining selected CODIS core loci plus the Penta E pentanucleotide locus. Three loci are included in both the *PowerPlex™ 1* System and the *PowerPlex™ 2.1* System. Together, the multiplex systems allow rapid analysis of all CODIS core loci plus gender identification and the use of a low-stutter pentanucleotide locus, Penta E.

The loci of both systems are being combined into a single multiplex for simultaneous amplification of 16 loci (i.e., all 15 loci described above plus the locus Penta D). This multiplex is called the *GenePrint® PowerPlex™ 16* System. In a single reaction, 32 primers are used to amplify all 13 CODIS core loci, Amelogenin, and two of the new low-stutter highly polymorphic pentanucleotide repeat loci.

Validation studies have been completed for the *GenePrint® PowerPlex™ 1.1* System. We have collaborated with other laboratories to determine the genotypes for at least 150 individuals in four population groups to calculate characteristic allele frequencies, power of discrimination, power of exclusion, and paternity indices for each locus and multiplex system.