DEVELOPMENT OF PowerSeq® SYSTEMS FOR FORENSIC IDENTIFICATION USING NEXT GENERATION SEQUENCING

Jaynish Patel, Spencer Hermanson, Leta Steffen, Cynthia Sprecher, Robert McLaren, Douglas Storts, Promega Corporation

Three systems have been developed to enable forensic identification of samples using next generation sequencing (NGS). The PowerSeq® Auto System includes all the loci in Section A of the proposed expanded CODIS core loci (D.R. Hares, Addendum to expanding the CODIS core loci in the United States, Forensic Sci. Int. Genet. 6 (2012) e135.). It also includes two loci from CODIS Section B (TPOX and D22S1045) and two highly polymorphic pentanucleotide loci, Penta E and Penta D. The combination of these 23 STR loci and Amelogenin make this multiplex an effective tool for human identification. The PowerSeq® Mito System includes reagents to produce a set of small amplicons for sequencing the mtDNA control region. Deep sequencing coverage and digital read counts resulting from NGS sequencing of mtDNA allows for increased discrimination power of mixed samples and heteroplasmy when compared to traditional sequencing approaches. Also, the use of small amplicons to sequence the mtDNA control region improves sequencing results from degraded samples. The PowerSeq® Auto/Mito System includes all loci from the PowerSeq® Auto System and the amplicons from the PowerSeq® Mito System combined into one multiplex. These systems are used in conjunction with the Illumina MiSeq System to generate a complete sequence analysis (STR genotype, STR repeat structure, mitochondrial haplotype and SNP information) from a single amplification and sequencing reaction.