

A RAPID PENTA STR SCREENING METHOD BY MICROCHIP CAPILLARY ELECTROPHORESIS

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Forensic DNA analysis involves the amplification and separation of length polymorphisms in the human genome for the purposes of identification. Due to the power of this technique for assisting law enforcement in solving crimes, there is a rising backlog of untested samples that need to be screened and analyzed. As a result of this problem and a similar need to develop procedures to screen evidence in remote locations, there is need for the development of rapid and portable genotyping systems. While short tandem repeat (STR) DNA analysis by capillary array electrophoresis is capable of high resolution and has a large power of discrimination in forensic identification, these instruments are not portable and require a relatively long sample run time. It is because of this problem that we began a project to develop a portable DNA screening method using a commercially available microchip system that utilizes short fluidic channels.

Generally speaking, microfluidic systems require fairly long channels and complex detection systems for proper resolution and accurate identification of forensic DNA. However there remains a need for portable systems with a small footprint for use in evidence screening. The Agilent 2100 Bioanalyzer uses small 2 cm microfluidic chips. Due to the short path length of these chips and the fact that they were designed to analyze dsDNA, most 4 base repeats will not properly separate on them. As a proposed solution, we have redesigned a set of primers for known pentameric STRs that permits the use of smaller, easier to separate polymorphic amplicons. Secondly, we have developed a novel mixture of polyvinyl pyrrolidone and hydroxyethyl cellulose that permits facile DNA separations. Lastly we have utilized a modified chip platform that permits single stranded DNA analysis. Our results show that baseline separation is possible on for these markers on a 2 cm chip, permitting their use in a highly portable genotyping system based on a 2cm pathlength microfluidic chips. This system should provide a useful tool for quick and portable screening in forensic DNA analysis.