RAPID PCR AMPLIFICATION OF STR TYPING KITS

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Forensic DNA typing is currently conducted in approximately 8 to 10 hours. The process includes DNA extraction, quantitation, multiplex PCR amplification, and fragment length detection. Today's commercial multiplex short tandem repeat (STR) typing kits are not optimized or intended for rapid PCR thermal cycling. Current protocols require approximately 3 hours for amplifying a multiplex containing 15 STR loci plus amelogenin.

With the continuing development of miniaturization technologies such as microfluidic and micro-capillary devices, there is a growing interest in developing an integrated DNA typing system capable of going from a buccal swab to a DNA profile in less than 2 hours. Such a rapid DNA typing device could be used for initial screening at a crime scene, at a border, or at airports. One component of such an integrated platform involves the reduction in time required for multiplex PCR amplification. The potential of reducing the required PCR amplification time may also benefit laboratories typing single-source reference samples.

Previous surveys of fast processing polymerases working in combination with rapid cycling protocols have resulted in the development of a 'rapid' PCR amplification protocol[1]. Results are obtained in less than 36 minutes when run in a standard peltier thermal cycler employing a heating rate of 4^{o}C/s. Capillary electrophoresis characterization of the PCR products indicates good peak balance between loci, strong signal intensity and minor adenylation artifacts. Genotyping results are concordant with amplification conditions utilizing a standard 3 hour (non-rapid) thermal cycling procedure. The rapid assay conditions are robust enough to routinely amplify 750 pg of template DNA.

An ongoing evaluation of forensic DNA typing as a potential biometric tool further work with various 'non-standard' thermal cyclers in combination with fast polymerases has resulted in decreasing the PCR amplification time to less than 20 minutes for a 16 locus commercial STR typing kit. Results will be shown for different STR multiplex assays amplified on various thermal cycling platforms.

[1]Vallone, P.M., Hill, C.R., Butler, J.M. (2008) Demonstration of rapid multiplex PCR amplification involving 16 genetic loci. *FSI Genetics* 3(1): 42-45.