INITIAL STUDY USING POWERPLEX® Y ON NONPROBATIVE SEXUAL ASSAULT EVIDENCE

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The forensic applicability of Y chromosome specific STR typing has been well established. Simultaneous amplification of STR loci located on the human Y chromosome can identify male specific DNA in samples, such as those from sexual assault cases. The Department of Forensic Biology currently uses a homemade Y STR multiplex, YM1, that detects four loci simultaneously (Prinz, M., Ishii, A., Coleman, A., Baum, H.J., Shaler, R.C.. Validation and casework application of a Y chromosome specific STR multiplex. Forensic Sci. Int. 120 (2001) 177-188.). A prototype of PowerPlex® Y was evaluated as a possible alternative to YM1 that would examine an increased number of loci and provide increased sensitivity.

The PowerPlex® Y manual allows for 28-32 cycles of amplification, and 10/20 and 10/22 cycling were compared in this study. 32 cycles (compared to 30 in YM1) was selected to optimize sensitivity. Also, a dilution series of quantified male DNA was run to determine the optimal input amount of target DNA as well as the minimum amount of input DNA required to obtain a complete profile. Nonprobative casework samples that had been previously analyzed using a Chelex extraction and PCR amplification of the YM1 loci were then reanalyzed using PowerPlex® Y. All amplified product was electrophoresed and the fragments detected using the ABI Prism 310 Genetic Analyzer. Allele designation was performed using a Promega PowerTyper Y Macro v.3 prototype.

Initial results indicate that the system is very sensitive. Complete profiles could be detected when as low as 50pg was amplified. No female amplification products were observed. However, amplification with both 30 and 32 cycles demonstrated that the system reacts negatively if the DNA input is too high. The signal intensity was quenched and the balance between loci suffered upon addition of 2ng of male DNA. Therefore the optimal input of target DNA was reduced to 0.5ng (compared to 2ng used in YM1). This is a challenge for male/female mixtures, such as those often seen in sexual assault cases, where the amount of male DNA is unknown. For YM1, the input amount of DNA for male/female mixtures had been validated in a rough correlation to the P30 antigen ELISA value. These guidelines will need to be reestablished based upon the higher sensitivity and the smaller window of DNA input tolerance. For this study, when reamplifying nonprobative casework samples it was necessary to reduce the volume of DNA solution in the reaction mix in order to avoid overblown signals.

The PowerPlex® Y system has shown thus far to be more sensitive than YM1, and was successful in detecting male alleles from evidence samples. It shows promise as a system that could update the Y STR multiplex currently used in the Department of Forensic Biology.