



A46 PowerPlex® S5 as a Simple, Cost Effective DNA Profile Screening Tool

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The goal of this presentation is to discuss the usefulness and applicability of Promega's PowerPlex® S5 mini STR system as a screening tool in forensic laboratories. The PowerPlex® S5 kit is composed of five multiplexed mini STR loci that may be used to screen multiple evidentiary stains to determine if they could have been contributed by the same or different individuals. The purpose of this evaluation is to determine if the use of the PowerPlex® S5 kit ultimately reduces the cost and labor of casework analysis and provides a significant amount of discrimination that would make its use feasible. The studies performed included sensitivity, cost effectiveness, degree of discrimination and a mixture evaluation.

This presentation will impact the forensic community by providing initial evaluation data for PowerPlex® S5 so that labs may have a better understanding of the system's advantages and disadvantages prior to purchasing it for their lab. PowerPlex® S5 is designed to decrease the cost and labor required for potentially extraneous casework analysis. By screening evidentiary stains with the S5 miniplex, there will be a decrease in the number of samples that require full analysis. The costs of materials, labor and time should be dramatically decreased as well. Conversely, this will increase the throughput for forensic labs and ultimately help to decrease the number of backlogged cases.

The PowerPlex® S5 loci include D8S1179, D18S51, FGA, TH01 and Amelogenin. The largest amplicon is FGA and it is less than 260bp. Of the 18 known samples used in this study, concordance was found between the DNA typing results obtained from PowerPlex® S5 and PowerPlex® 16 kits on all samples. All of the samples were analyzed using an Applied Biosystems 3130xl with GeneMapper®ID software v3.2. Each sample was injected at 3kV for 3, 5, and 10 seconds. The 5 second injection results are discussed here as that is Promega's recommendation for sample injection time.

Sensitivity studies included 5ng, 2.5ng, 1.26ng, 0.625ng, 0.312ng, 0.156ng, 0.078ng and 0.039ng. A full S5 profile was generated for 5ng through 78pg Allelic dropout was detected at 39pg. The same sensitivity samples were analyzed with PowerPlex® 16 and it was found that full profiles were obtained at 5ng through 156pg and dropout occurred at 78pg DNA. However, the optimal amount of DNA for PowerPlex® S5 was found to be between 0.2 and 0.6ng. This makes PowerPlex® S5 an ideal system for use in forensic casework labs where evidentiary DNA concentrations are not always abundant.

PowerPlex® S5 employs hot-start DNA technology. The *Taq* DNA polymerase is included as part of the system. This eliminates the need to purchase *Taq* separately and helps to decrease the cost. Based on reagents only, the cost per reaction with PowerPlex® S5 is \$10/reaction compared to \$17.50/reaction with PowerPlex® 16. If PowerPlex® S5 was employed as a screening tool and minimized the number of samples that required analysis with PowerPlex® 16, the cost savings could be dramatic. Also, because fewer samples are being analyzed with PowerPlex® 16, the analysis time will be shortened. The five loci of PowerPlex® S5 require much less time to analyze and samples can be quickly screened as evidentiary relevant or not.

Within the samples analyzed in this study, 14 were from the same family. This was done to demonstrate the power of discrimination of PowerPlex® S5. All 14 familial profiles were different. The power of discrimination of these 14 samples ranged from 1 in 36,000 to 1 in 1.7 million within the Caucasian database at the Palm Beach County Sheriff's Office. With this high level of discrimination, PowerPlex® S5 is a powerful tool in screening samples from mass disasters or in reducing the number of samples that require conventional STR analysis.

Mixed DNA samples were evaluated based on the percent of total loci where a mixture was indicated. For a 1:1 female to male mixture, PowerPlex® 16 indicated a mixture at 63% of the loci. As the female to male mixture increased, the ability of PowerPlex® 16 to discern a mixture drastically decreased. However, PowerPlex® S5 indicated a mixture at 40% of the loci for a 25:1 female to male mixture.

The data obtained in this evaluation indicates that PowerPlex® S5 would be a cost effective and reliable screening tool for forensic casework labs.

PowerPlex®, Mini STR, DNA