B5 Optimizing the Processing of Databasing Samples Using the Hamilton® easyPunch™ STARlet

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Learning Overview: After attending this presentation, attendees will gain an increased understanding of the capabilities of a fully automated punching and liquid handling instrument for reference sample processing.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by increasing knowledge to those laboratories faced with a backlog of samples and outside pressure to decrease turnaround times.

The passing of new legislation allowing for the collection of DNA samples from arrestees has led to some laboratories facing a significant increase in the number of samples submitted. Frequently, a crime lab's databasing section's budget and staff have not increased proportionally, creating a backlog situation. Direct amplification of reference samples has increased efficiency compared to the traditional extraction, quantification, amplification method but still requires staff to either manually remove 1.2mm punches or manually feed a semi-automated instrument. Subsequently, the analyst or technician must perform the amplification setup as a separate process and procedure.

This study evaluated the Hamilton® easyPunch™ STARlet and its ability to improve the efficiency and throughput of a databasing section. The easyPunch™ is designed as an "all-in-one" system that will provide both punching and liquid handling with minimum human interaction. Theoretically, an analyst or technician would load the instrument, initialize the run, and return at the end with a fully punched and master mix added 96-well plate ready for a thermal cycler.

The adoption of any new method or technology requires careful consideration to ensure that solving one bottleneck does not result in creation of another. Increasing the throughput on the front end of punching and amplification is only successful if the quality of the data is consistent with the previous method. This study compared both the throughput and data quality from samples processed with manual or semi-automated direct amplification methods to the fully automated method.

Three direct amplification chemistries manufactured by three different companies were evaluated as part of this study. ThermoFisher's Globalfiler™ Express, Promega's PowerPlex® Fusion 6C, and Qiagen® Investigator 24plex GO! were chosen as they all contain the CODIS core 20 loci and contain additional Y chromosome specific loci. By testing a variety of amplification kits, the resulting data is applicable and beneficial to most databasing sections.

Ninety (n=90) Bode Buccal 2 collected samples were processed with each of the amplification kits using the Hamilton easyPunch™ STARlet as well as manually punching and adding the amplification reaction mix. The resulting DNA profiles were analyzed using appropriate laboratory analytical and stochastic thresholds. The data metrics recorded and compared included first pass success rate, average locus peak height, and average intra-color balance. Additional quality control metrics evaluating positive and negative controls as well as sample integrity were completed.

The optimized protocol provided a method to obtain a 96-well plate containing both lysed sample punches and amplification master mix in under two hours with minimal human interaction. The plate is then sealed and centrifuged off deck prior to continuing with downstream processing. All resulting positive and negative control samples provided results consistent with manual amplification set up. Zero to two clean punches were evaluated to prevent sample carryover, results indicated that one clean punch optimized sample integrity and punching efficiency. All samples provided profiles that met laboratory guidelines for each kit with regards to analytical and stochastic thresholds. The results from this study show that a fully automated platform can increase a laboratory's efficiency without decreasing profile quality or success rates.

Direct Amplification, Databasing, Efficiency