Abstract

DNA is recognized as one of the most powerful tools for law enforcement agencies to make connections and to investigate crimes. Across the nation, use of DNA evidence has lead to both increased convictions of violent criminals and the exonerations of innocent individuals. The utilization of DNA as an investigatory tool however has been hindered by the cost of DNA analysis and long turnaround times throughout the nation. This poster presents the Kauai Police Department’s internal validation and case work implementation of the LGC ParaDNA Screening and Intelligence System. Increased case work efficiency and cost-effectiveness can be achieved by the utilization of the ParaDNA System across all samples following the ParaDNA User’s Guide through comparison of the seventy-two samples, with validations performed by LGC and independent laboratories. Case work has demonstrated the ability to screen a larger number of items that would have previously gone unexamined, while maintaining cost effectiveness. For only a few minutes of hands on time and approximately five minutes of processing time, the ParaDNA System allows for the triage of evidentiary items and the acquisition of actionable intelligence. The system encompasses two tests, the Screening Test and the Intelligence Test. The screening test provides a percentage score related to the quantity of DNA present and information pertaining to the sex of the donor. The Intelligence Test is able to determine an STR profile containing up to five STR loci and Amelogenin gender determination.

Screening Test Validation

Internal validation of the ParaDNA Screening System included analysis of cellular DNA (DNA in hand, DNA in sample storage, and saliva-deposited DNA, found on a cellular DNA kit and a metallic surface, respectively). The DNA from these sample types was isolated using the ParaDNA kits and analyzed on the 3.5/3.0 and 1.0/1.5 amplicon panels. These samples were then subjected to further testing in order to determine the ability of the ParaDNA System to detect the expected DNA profiles.

Performance of the ParaDNA Screening Test was tested against an expected DNA profile in order to determine the STR profile expected from the sample and the expected STR profile. The results of the screening test were compared to the expected STR profile in order to determine the ability of the ParaDNA System to detect the expected DNA profiles.

Known Mock Evidence: Precision, and Accuracy

The precision and accuracy of the ParaDNA Intelligence System was assessed by performing a mock sample analysis. Samples isolated from the ParaDNA Screening System were submitted for analysis. Test results were obtained indicating that the ParaDNA System was able to accurately determine the STR profile.

Mixture Analysis

Mixture samples were performed through the analysis of samples collected in a crime laboratory, specifically focusing on the efficacy of the ParaDNA System in the detection of multiple profile samples. Mixture samples were analyzed using both the ParaDNA Screening System and the ParaDNA Intelligence System. The ParaDNA System was used to detect the expected STR profile. The results of the mixture analysis were compared to the expected STR profile. The ParaDNA System was able to accurately determine the STR profile.

Sensitivity / Dilution Series

The initial approach to measuring sensitivity was to create a dilution series of sample and sample add-ins of varying levels and then test the ParaDNA System. The dilution series consisted of a range of sample concentrations, with the addition of varying levels of sample contamination. The ParaDNA System was able to accurately determine the STR profile for all dilutions tested. The ParaDNA System was able to accurately determine the STR profile for all dilutions tested.

Implementation and Cost Analysis

We have observed a total cost savings of $5,000 per case in the ParaDNA System at a cost of approximately $25,000. To use the same DNA screen samples an additional $5,000 to $7,000 would have cost approximately $65,000 - $85,000.

Early Successes:

The ParaDNA System was used in multiple property cases where we were able to identify potential sources of DNA at crime scenes. This resulted in a decrease in the number of suspects/victims and a decrease in the number of suspects/victims.

Example: Amended Event Based Series

A sample was sieved that would otherwise have targeted two, at a cost of approximately $65,000. This sample was not able to determine the DNA profile.

Conclusion:

The LGC ParaDNA System is a valuable tool for law enforcement agencies. The system provides increased case work efficiency and cost-effectiveness. The system provides increased case work efficiency and cost-effectiveness. The system provides increased case work efficiency and cost-effectiveness. The system provides increased case work efficiency and cost-effectiveness.