Crime Laboratory Approved DNA Screening Technology

Introduction

There are various types of evidence that can be collected at a crime scene. Unfortunately, not all the evidence collected will generate a usable DNA profile. Crime laboratories are often overwhelmed with evidence, and therefore, may have submission policies or limitations on the number and or types of samples that can be submitted. Prioritizing the samples for submission/processing can be a difficult task. Often, the decision on which samples to process is based on experience and historical data, as there is little objective data available.

LGC’s ParaDNA Screening System helps with this decision making process. In just 75 minutes, it is possible to determine if human DNA is present, predict the likelihood of generating a usable STR profile and indicate the gender of the contributor. This presumptive test provides scientific data that aids in the triage process and prioritization of which samples to submit to the crime laboratory.

The ParaDNA Screening System provides a relative quantitative assessment of DNA sampled from evidence items. Thus, allowing the evidence collected at a crime scene to be screened and then prioritized for submission to STR analysis. Screening samples before STR analysis can save time, money and resources, as well as, improve success rates and turnaround times. In the developmental validation, the ParaDNA Screening Test showed a high percentage correlation with traditional STR analysis, with approximately 25% of samples correctly screened out. This quick and simple test allows ParaDNA to augment and enhance existing screening procedures and help prioritize samples to increase first pass success rates by providing higher quality samples to STR analysis upfront.

To assure the performance and process claims of the ParaDNA Screening System, LGC has conducted a series of rigorous external evaluation for your information.

Pilot Testing

LGC undertook pilot evaluations with a Florida Crime laboratory, a Pennsylvania Crime laboratory and a Michigan Crime laboratory for ParaDNA Screening System.

The ParaDNA Screening System is designed to be simple and quick to use (figure 1). The ParaDNA sample collector is used to obtain DNA from a swab or evidence item, following LGC recommended sampling guidelines.

Once DNA is collected, the ParaDNA sample collectors are then inserted into the ParaDNA Screening Tests which contain the PCR reagents. Then this is loaded on the ParaDNA Screening System. After a 75 minute run time a ParaDNA percent score is displayed, which indicates the quantity and quality of the DNA added to the test. Also, a gender result may be provided in cases where there is sufficient DNA detected by the gender specific markers within the ParaDNA Screening Test.

After training was provided, each participating laboratory created mock crime scene samples representing common evidence items, which contained a range of DNA template levels. Sample items included, but not limited to, tools, weapons, drinking vessels, clothing, cigarette ends, chewing gum and blood stained items. These items were processed according to LGC ParaDNA recommended guidelines using the ParaDNA Screening System. To demonstrate STR correlation, all samples screened were sent for full DNA analysis, regardless of ParaDNA result. See table 1 below for details of the samples processed during these studies.
Results

The ParaDNA Screening System results were measured against STR profiling success (number of alleles) using Promega PowerPlex® 16 at the participating Florida and Pennsylvania Crime laboratories. PowerPlex® 16 HS system was used at the participating Michigan Crime Laboratory. The threshold lines have been set using 2% for ParaDNA score as this is the lowest result that indicates amplifiable DNA is present. The profile threshold which determines whether STR results are useful has been set at 14 alleles. This means True Positives are in the top right corner of the graph, True Negatives in the bottom left, False Positives in the bottom right and False Negatives in top left.

Conclusion

The ParaDNA Screening System allows the operator to conduct a straightforward presumptive test using DNA technology. This process augments existing forensic procedures and allows the user to triage and prioritize samples within a case for further STR analysis.

The integration of ParaDNA technology has been simple; requiring limited procedural changes. In addition, the mock data demonstrates that there is a relationship between the ParaDNA results and the subsequent profiles obtained from those samples (figure 2 and table 2).

The success of the pilot evaluations at these US Crime laboratories has demonstrated an application for this technology. The laboratories that have participated in this pilot have identified that this technology is best
placed with their submitting Law enforcement agencies rather than as part of their process. With this information several of the US pilot crime laboratories\(^1\) plan to host workshops with their submitting agencies in the view to implement this technology. Also, the participating Florida Laboratory will be presenting their pilot evaluation data at the upcoming American Academy of Forensic Sciences (AAFS) meeting in February 2014.

As with any new technology implemented for forensic use, the optimal use of the technology can depend significantly on the case scenario and the samples collected. Based on the outcome of external pilots, it is clear that the ParaDNA Screening System is both ready and fit for purpose; the triage and screening of crime scene evidence to improve and enhance the police force submissions process.

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\(^1\) A Washington DC Crime laboratory also participated in this pilot, results from this testing were not available at the time of this publication but will be added at a later date.

**References**

Application – note ParaDNA Screening Test  
http://paradna.lgcforensics.com

Application – note ParaDNA Screening System – UK Police  
http://paradna.lgcforensics.com

M. Aufiero  
Predicting the quality of DNA profiles through the evaluation of the paraDNA screening instrument  
American Academy of Forensic Sciences (AAFS) 66th Annual Scientific Meeting — Seattle, WA 2014
ParaDNA are a range of products that use LGC’s HyBeacons® technology to isolate, amplify and characterize DNA in a single test.

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<th>Part. no</th>
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<th>Quantity</th>
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<td>ParaDNA® Screening Test</td>
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<td>For triaging evidence items to identify those most likely to generate a usable STR profile by providing a % ParaDNA quality score.</td>
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<td>4490011</td>
<td>ParaDNA® Intelligence Test</td>
<td>8 tests</td>
<td>For rapid generation of 5 STR profiles that can offer advance intelligence from evidential items, permitting investigators to quickly eliminate samples that relate only to the victim and identify those that may relate to a suspect.</td>
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<td>ParaDNA® Sample Collector</td>
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<td>Patented sample collector for direct and indirect swabbing of evidence items. The ParaDNA Sample Collector is required for use with the ParaDNA Screening and Intelligence Tests.</td>
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<td>ParaDNA® Screening Test Positive Control</td>
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<td>For use with the ParaDNA Screening Test when assessing the function of the ParaDNA Screening Instrument.</td>
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<td>Instrument required to carry out ParaDNA Screening &amp; Intelligence tests. The ParaDNA Screening Instrument is also supplied with the ParaDNA Software needed to interpret the results of these tests.</td>
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<td>TBC</td>
<td>ParaDNA® Field Portable Instrument</td>
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<td>Laptop Computer</td>
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For more information and to discuss how ParaDNA can work for you, please contact us at: paradna@lgcgroup.com or call on +44 (0) 844 2641 999

www.paradna.lgcforensics.com

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