IMPROVING WORKFLOW EFFICIENCY FOR CHALLENGING SAMPLES UTILIZING NEW TECHNOLOGIES

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The past 25 years have seen great strides in forensic DNA analysis. Improved evidence collection procedures and technology advancements using the PCR process have enabled scientists to provide scientific evidence in criminal cases that were previously unimaginable. Next generation platforms and test systems will now provide scientists with the tools to evaluate DNA samples that may consist of degraded DNA and/or trace, touch, or contact DNA evidence. Typically, degraded DNA samples have multiple challenges, including limited quantity, the presence of PCR inhibitors, and issues with result interpretation. These factors make it difficult to obtain interpretable profiles. Therefore, there is a need for more robust, highly sensitive, reproducible methods for the assessment (i.e., quality and quantity) of DNA extracts to determine optimal downstream processing methods, as well as improved typing systems for profiling these difficult samples.

We report here utilization of a combination of two recently developed technologies to improve the success rate of obtaining results from highly compromised degraded as well as trace samples. A quality/quantity sample assessment can be effective in determining which typing system to use, as well as how much DNA to take forward to the typing stage with the highest chances of first pass success rates, eliminating the need for re-works. The new DNA quantitation kit, InnoQuant™, is designed to generate more accurate and reproducible information about casework samples. This next generation DNA quantitation kit allows accurate quantitation at picogram levels (~1 pg) of two autosomal targets: a “short” Alu based target of 80 bp in size, and a “long” target from a separate retrotransposon of 207 bp in size. Additionally, an Internal Positive Control (IPC) is included to assess PCR inhibitors present in a sample. Studies presented will demonstrate the ability InnoQuant™ kit to provide clear choices to a DNA analyst regarding which typing test kit to use, as well as the proper amount of DNA to take forward, based on the sample’s Quality Index (QI), or degradation state. Additionally, the correlation between quantitation values (or QI) and profile recovery will be discussed.

Once the determination is made of how much DNA to take forward to the typing stage with the highest chances of first pass success rate, several systems are now available to enhance a laboratory’s ability to obtain a usable, interpretable DNA profile. One of these systems, the InnoTyper™ *Alu* based marker system, can be utilized for DNA typing of highly degraded DNA samples, thus eliminating the need to resort to mtDNA sequencing for many samples. The system contains 17 retrotransposon element bi-allelic markers, ranging in size from 50-125 bp, making the assay highly sensitive for degraded samples. The application of the InnoTyper™ system to forensic samples, such as hair shafts, will be presented. These processing decisions made more intelligibly with the use of the InnoQuant™ and InnoTyper™ next generation systems will undoubtedly improve efficiency in workflow and conserve the consumption of limited and trace samples.