

HUMAN IDENTIFICATION IN LESS THAN 45 MINUTES: A RAPID AND FULLY PORTABLE DNA SOLUTION

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In recent years, major progress has been made towards the development of fully integrated rapid DNA analysis devices; however, their portability to crime scenes for on-site DNA processing is limited due to their size. Overall, the existing rapid DNA devices are large and potentially require additional vehicles for transport to a crime scene. To address the need for a smaller, more portable, rapid DNA analysis system, Bode Cellmark Forensics, Inc. has developed a human identification SNP assay for use with the RAZOR[®] EX instrument (BioFire[™] Defense, Salt Lake City, UT). The RAZOR EX is a lightweight real-time thermalcycler typically used for the detection and identification of pathogens and biothreat agents. Commercially available RAZOR EX assays are performed in under an hour using a rapid extraction method and a specialized pouch containing lyophilized amplification reagents. Additionally, the device has an on-board LCD screen that displays the assay results in real-time.

To adapt the RAZOR EX instrument for human DNA analysis, a multi-phased approach was taken to develop a human identification system: a simple, rapid, and efficient extraction method was created that is capable of lysing blood, semen and epithelial cells in under 15 seconds; a customized TaqMan[®] allelic discrimination assay capable of amplifying forensic samples was developed using SNPs that were previously characterized for forensic use; two amplification controls were designed to estimate the quantity and quality of the forensic sample; and the amplification reagents were lyophilized to ensure the stability of the assay at room temperature. While the assay results can be easily interpreted from the RAZOR EX's LCD screen, a software application was also developed to provide more accurate data analysis and to allow population statistics to be applied to the sample. The entire process, from collection to result, has been performed on evidentiary samples in less than 45 minutes. The development effort concluded with a full developmental validation. The system demonstrated accurate, precise and reproducible results in the range of 0.1-10 ng DNA per well. Full profiles were also demonstrated with 1µl of blood and semen and 5µl of saliva.