

VALIDATION OF THE TECAN EVO 150 FOR USE IN FORENSIC CASEWORK

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The demand for DNA analysis on forensic samples has increased over the past several years because of greater awareness of the value of DNA amongst law enforcement and the community. In addition, advances in sensitivity have made more samples amenable to testing. The increasing demand has put a strain on forensic biology laboratories and, in response, labs are considering automating their processes. Automation decreases the time an analyst spends manipulating samples which in turn increases throughput.

Forensic labs are taking cues from high-throughput biotechnology and clinical labs and integrating robotic equipment into their workflow for DNA extraction, quantification and amplification. These systems, although designed to perform the same functions in a DNA lab, must be validated to forensic lab standards within each lab.

We used a Tecan Evo 150, an automated liquid handling workstation equipped with eight non-disposable, fixed tips for liquid mixing and transfer. We programmed it to combine reagents into a master mix, to create quantification standards and to transfer samples from 1.5 mL tubes to 96-well plates or from plate to plate to prepare quantification, dilution, normalization, and amplification plates. The tips move independently, allowing the robot to "cherry pick" samples, making the Tecan faster than other systems using non-independent tips. The Tecan automates the repetitive, tedious and time-consuming pipetting tasks formerly performed by analysts. Validation of this system for use in forensic casework included studies on fixed-tip decontamination, sensitivity, accuracy, precision, reproducibility, minimum volume requirements, and calibrations for different liquid classes.

The forensic community demands constant vigilance over possible sources of contamination so it seems counterintuitive to use a robot with non-disposable tips for forensic samples. Results showed, however, that the fixed-tips are successfully decontaminated between samples by successive washes with a 2% bleach solution. One hundred seventy-one reagent blanks were processed in various patterns on the Tecan Evo 150 during this validation and none showed evidence of contamination from the fixed-tips or otherwise.

More than 39 instrument runs and 1200 samples were processed on the Tecan Evo 150 for this validation. Reproducibility was established both within and between runs on 54 samples over two runs. The Tecan Evo 150 accurately and precisely delivered 2-350 μ L with < 5% error and 1 μ L with <10% error. The Tecan Evo 150 consistently delivered 10 μ L from a 1.5 mL tube containing 20 μ L with accuracy (<5%) and precision (<1%CV).

Through this validation, the Tecan Evo 150 has been proven to perform as well as current methods. It provides accurate and reproducible results and does not introduce contamination from its fixed tips. Additionally, the Tecan is cost effective in that it does not use expensive disposable tips, it can prepare successful half-volume Quantifiler Duo reactions and it reduces the amount of manual labor involved in plate preparation. Integrating this system into laboratory workflow has increased throughput enabling our lab to meet the high demand for DNA analysis on forensic samples.

Our approach included having staff learn to program the robot's workflow scripts so that de novo methods could be developed in-house without assistance from Tecan or other IT personnel. New scripts were prepared and validated for each step in the operation of the robot. This approach assures that the robot will accommodate our methods now and in the future.