THE EFFECT OF AUTOMATED METHODS ON FORENSIC DNA WORKFLOW MANAGEMENT

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In forensic laboratories, manual DNA profiling workflows often involve “case ownership” that starts at sample storage retrieval and extends through processing and data analysis, to final report writing. This workflow often involves a high degree of manual input, which is time-consuming, subjective and prone to human error. Robotic instruments can automate sample processing and increase sample throughput through batched parallel processing. This is demonstrated by the Texas Department of Public Safety in Houston, TX, who reported validation of its Hamilton AutoLys STAR-plus liquid handling workstation in 2014 for use in forensic casework. They showed that the automated processing workflow met their criteria for accuracy, precision and reproducibility compared to manual liquid handling for all target volumes. While the obvious advantage of automated processing includes a higher throughput of samples processed in a given time period, additional benefits were derived from labor efficiencies and standardization.

Fixed labor costs comprise a significant portion of the forensic lab budget, so one key benefit of an automated system is enabling reallocation of manual labor to other activities. Automated sample processing reduces active labor time and eliminates the need for time-consuming verification checks by separate personnel. This frees personnel to focus on other tasks, thereby increasing productivity, and also reduces fatigue, which may further contribute to sources of error. Additionally, the increased throughput aids turnaround times (TAT) as it reduces or eliminates storage stop points related to instrument availability or batching requirements.

Automation improves standardization of DNA profiling workflow traceability and documentation compared to manual methods. Barcoded samples maintain traceability through the workflow without risk of mis-labeling or transcription errors. This improves reliability of results, reduces active labor time associated with manual documentation and enables fast identification of the appropriate personnel needed for court testimony. Automatically generated worklists also reduce risk of error from manual input and processing methods and reduces the need for time-consuming verification checks. Generated reports are output in a consistent format without manual transcription errors or verification checks; and if integrated with laboratory information management system (LIMS) software, data can be sent to other peripherals or stored and recalled quickly.

Here, we report implications of the automated processing method in context of labor savings and other key performance indicators in the overall DNA profiling workflow.