A151 Performance Evaluation of a New 14-Channel Extraction Robot

Mario Scherer, PhD, and Thomas Schnibbe, PhD, QIAGEN GmbH, QIAGEN Str. 1, Hilden, 40724, GERMANY*

The goal of this presentation is to share validation and customer evaluation data on a new platform for automated low- to medium- throughput extraction of nucleic acids from demanding trace material as well as reference samples.

This presentation will impact the forensic science community by enabling forensic investigators to process case evidence with higher speed and accuracy and in a standardized manner with greater consistency and reproducibility.

Forensic DNA laboratories are challenged by the requirement to provide results on the identity of genetic evidence within a very short time. This holds true for important casework evidence as well as for reference samples taken from suspects. This often requires the start of DNA extractions immediately after reception of samples and to work in comparatively small batch sizes. Fast low-throughput robotic extraction systems have found widespread utilization for this purpose.

Recently, a second generation instrument system has been developed incorporating additional functionalities to meet increasing requirements regarding forensic process safety: A UV lamp decontaminates the inner surface of the workstation, which helps to eliminate sample carryover from run-to-run. Forensic data management and chain of custody are improved in the new system. Barcode reading enables complete tracking of samples and reagents throughout the entire purification process. Reagent identification and lot numbers are logged and all relevant process

information is documented in a report file that can be either sent to a connected PC or a small printer available for the system.

The instrument enables nucleic acid purification from a wide range of forensic reference and casework samples. Utilization of pre-filled reagent strips reduces the risk of contamination during setup. Throughput is increased to accommodate the simultaneous extraction of up to fourteen samples in a single run which allows the integration of positive and negative extraction controls more easily. The instrument is operated using application specific protocol cards. A dedicated protocol card for human identity related applications stores various protocols for the extraction of forensic samples. A large volume protocol allows the use of up to 500 µl lysate as input for nucleic acid extraction. A so called “tip dance” protocol simplifies handling of samples that contain solid substrates, such as swabs, dried blood spots, fabrics, or cigarette butts. Furthermore, there is no need for removal of solid material prior to extraction. Various elution volumes down to 40 µl can be combined with any protocol to yield more concentrated DNA and to improve sensitivity in downstream STR analysis.

The 14-channel instrument was evaluated for the extraction of various typical crime scene or reference sample types. Buccal swabs were reliably processed using the “tip dance” protocol. Negative extraction controls run in parallel all turned out to be free of contaminating DNA, proving exclusion of sample carry-over. DNA was purified from cellular material on demanding casework samples known to contain high amounts of potent PCR inhibitors, like strongly colored leather substrates. No inhibitory effects were observed in downstream quantification PCR or STR analyses and full profiles were obtained.

Automation, Nucleic Acid Extraction, DNA

 ** Presenting Author*