

Catching up on crime

A Freedom EVO® 100 liquid handling workstation is cracking the workload of the Missouri State Highway Patrol Laboratory, Jefferson City, Missouri, USA, automating all the steps of DNA purification and tackling a backlog of thousands of forensic samples.

Crime

The Missouri State Highway Patrol Laboratory in Jefferson City covers all forensic disciplines, including trace evidence, toxicology, drugs, firearms and fingerprinting, with 10 criminologists entirely dedicated to all types of DNA cases, ranging from theft and burglary through to sexual assault and homicide.

During the past five years, with the emergence of more reliable and accessible DNA technologies, the laboratory has seen higher numbers of low level DNA samples, no longer coming just from bloodstains on the floor or evidence of sexual assault, but now taken from anything a suspect may have touched, like door handles and drinking glasses. Then, two years ago, the state of Missouri ruled that DNA should be collected from all crimes, not just violent ones, increasing sample numbers even further. Together these factors have resulted in a 50 % rise in DNA samples the laboratory receives over the last three years.

Brian Hoey, supervisor of the DNA unit at the Highway Patrol Laboratory, explained: "We are currently facing a backlog of 1,300 cases, or approximately 6,000 samples, representing nearly one year's workload for us. Before the policy changes, we relied on manual techniques for DNA preparation but the issue of throughput became overwhelming. At the same time, laboratory space was an important consideration. All the forensic disciplines are housed together here,

in an area of 11,000 square feet. We already stagger shifts to manage the number of people working at any one time and it was obvious that we needed to bring in an instrument to cope with the workflow. I visited other laboratories with similar requirements to ours, saw Tecan workstations in operation and soon recognised that the Freedom EVO workstation could do everything I wanted it to. To take the jump to automation, I wanted to be sure that we would be able to perform all the steps of DNA purification – extraction, quantification and amplification – on a single platform, removing the need for any manual intervention."

Validation too, of course, was an important consideration that Brian had to take into account: "We follow guidelines set down by the American Society of Crime Laboratory Directors Laboratory Accreditation Board that specify the validation of every instrument used in criminology investigations. Our internal validation procedures test for three things: sensitivity, precision and reproducibility. We look at samples that are environmentally insulted, such as contamination with oil, grease or dirt, and including sexual assault samples, like semen and vaginal swabs. We also test samples from different animals to see if the instrument operates differently with, for example, deer blood rather than human blood. Finally, we check traceability, another element of the validation process, ensuring that the



Shawn Bailes and Shena Latcham, principal
Tecan Freedom EVO investigators

sample bar coding system will help us to track samples through a chain of custody. We fully expect to see more consistency in our results with automation compared to manual procedures, and the instrument will be able to extract DNA from low level samples virtually every time, without the hit and miss problems associated with human error in manual procedures.”

The laboratory is now at the point of running blood and buccal swab samples to accustom the operators to the instrument, reagents and workflow. Brian continued: “Once we start to get good data and know how to operate the instrument, we will simply set up a 96-well plate, place it in the instrument and this will validate at the same time as the samples are run, allowing all the validation to be completed within one or two runs. This is quite a contrast to what we had to do in the past, where validation could go on for years. We’re also sharing this data with other laboratories in similar stages of validation through our Tecan representative.”

According to current timescales, the Freedom EVO workstation will go online in the Autumn of 2008, with the Tecan system performing the steps of DNA extraction and quantification using real-time PCR. Brian added: “The workstation is working very well, freeing the analysts to open up more evidence and gather samples, and the bottleneck is moving from the wet chemistry to the data analysis so we are currently investigating how to address this.”

He concluded: “I know the anxieties that we had when first considering automation and I would like to be the first to reassure other people who are currently going through those same concerns. I am very excited about our set-up now and am more than willing for people to come and see our workstation in action. From my initial impressions, and from what I’ve now learnt from experience, I truly believe this is the best instrument currently available for forensic applications such as ours. With the help of the Tecan application support team, we have developed a system that does exactly what we need.”

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