## Automation of DNA analysis boosts the fight against crime

The DNA Analysis group at the Hessen Landeskriminalamt in Germany has automated DNA trace analysis with the HID EVOlution™ System, increasing throughput of crime samples, providing results in approximately three days and improving the quality of analysis.

The DNA Analysis group at the Hessen Landeskriminalamt, Germany



The Landeskriminalamt (LKA) in Wiesbaden is the main headquarters of the criminal investigation department in the German State of Hessen. The LKA includes a Department of Forensic Science that serves all police departments, prosecutors and courts in the district, and, within this, a group dedicated entirely to examining evidence that carries organic traces or textile fibres. Dr Diane Schmidt, leader of the DNA Analysis subgroup investigating burglary and theft, described the laboratory's workload: "Last year, we analyzed 50,000 traces received from around 4,000 criminal cases, collected from all kinds of objects, from furniture to bottles, tool kits, door handles, simply everything; everything people touch or work with can carry DNA traces. At the time we analyzed 20,000 of these with the HID EVOlution System, and a proportion was outsourced to local forensic medical institutes. In the long term, however, we had been looking at how automation could help us to bring as much of this work in house as possible, to give us the capacity to handle the anticipated increase in cases and to give us tighter control on our samples and their analysis."

Diane was involved in the initial choice of an automated system in 2007 after looking at several available systems and sharing the experiences of other state forensic departments in Germany. "Several factors influenced our decision to choose the HID EVOlution System," she said. "Our colleagues in other LKAs had positive experiences using the system, and the system is very flexible, handling sample preparation from different sources if required. The combination of the reliable Freedom EVO® platform and dedicated software from Tecan with scripts developed by Applied Biosystems (Life Technologies) was very important to us, and produced a really useful prevalidated system for forensics. Although we still needed to perform our own validation within the laboratory to adjust the system to our particular requirements, we could rely on many things that were part of the pre-validation package, and this certainly made the whole process much easier. The HID EVOlution, together with the Applied Biosystems PCR systems and genetic analyzers, is able to address the handling of all five steps of trace analysis - extraction, quantification, amplification, genetic analysis and evaluation of results - but it is very user-friendly and easily managed by our six technical assistants. For crimes such as theft or burglary, the samples are put directly onto the 'street' (the laboratory workflow) on the HID EVOlution System and we will have the results within three days."

The first phase is DNA extraction using the HID EVOlution extraction system and the PrepFiler<sup>®</sup> forensic DNA extraction kit, followed by amplification by real-time PCR, and quantification on the Applied Biosystems 7500 Fast Real-Time PCR System. The next step is simultaneous amplification of this DNA with eight markers required by the German DNA database and three additional STR loci required by the European Network of Forensic Science Institutes (ENFSI). On the next day, amplified DNA samples are genetically analyzed – with 80 samples per cycle – in the Applied Biosystems 3130xl Genetic Analyzer, and results are evaluated with GeneMapper® ID-X software.

## CAUTION



The HID EVOlution extraction, HID EVOlution qPCR/STR and Freedom EVO CE set-up systems

"The purity of the DNA samples extracted on the HID EVOlution System is excellent," Diane added. "The extraction chemistry handles our range of different trace materials very well, and the system itself is very reliable. The HID EVOlution workstation extracts comparable quantities of DNA to our manual extraction method (see Table 1), and we are able to achieve higher levels of PCR amplification from the same amount of starting DNA, which is important when the quality of DNA can sometimes be poor due to degraded samples. We still manually analyze traces from serious crimes, such as murders, because results are required by the next day, but automation really comes into its own when analyzing large numbers of samples. The DNA 'street' automated laboratory workflow has helped us to achieve extremely short processing times of just eight to ten weeks for burglary trace analyses – a processing time unique throughout Germany – and another big advantage is the collection of data not only from single cases but also on mass crime in the area."

The laboratory in Wiesbaden currently handles trace analysis for both minor and serious crimes from two police headquarters in Hessen, and only serious crimes for the remaining police headquarters, with their traces from minor crimes handled by the local forensic medical institutes. An additional HID EVOlution System is in the pipeline, taking advantage of the efficient automation process that has been developed, and the Department is confident that it will soon be able to handle the anticipated increase in workload to 60,000 trace samples a year. Diane concluded: "We are very happy with the system and have had great support from Tecan and Applied Biosystems (Life Technologies) in setting up the right solutions for our laboratory."

To find out more about the HID EVOlution System, visit **www.tecan.com/hid** 

For more information on the Hessen State Criminal Office, visit www.polizei.hessen.de/hlka/

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## Table 1: Comparison of DNA quantity extracted from blood discs with the standard manual method and the HID EVOlution System

Number of blood discs	Average DNA yield [ng/µl]		Comparative yield
	Manual method	HID EVOlution	(% of manual yield)
2	0.45	0.42	93 %
4	0.86	0.82	95 %
6	1.13	1.06	94 %
8	1.54	1.80	117 %

Comparison of DNA extracted from blood discs with the standard manual method and the HID EVOlution System