

complete ROBOTIC Automation of a FORENSIC DNA typing facility

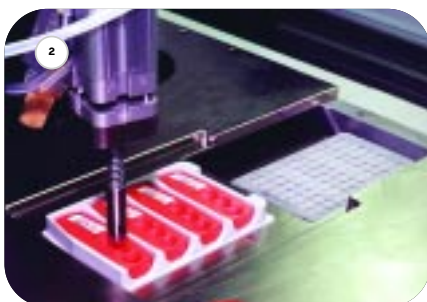
The DNA Unit of the South African Police Service's (SAPS) Forensic Science Laboratory (FSL) is in the process of establishing a fully automated genetic typing laboratory.

The SAPS FSL DNA Unit is responsible for the maintenance of a national forensic DNA databank, or DNA Criminal Intelligence Database (DCID). The brief for the development of the automated laboratory, referred to as the Marshal System, was to expedite the analysis of reference DNA samples submitted for inclusion in the DCID.

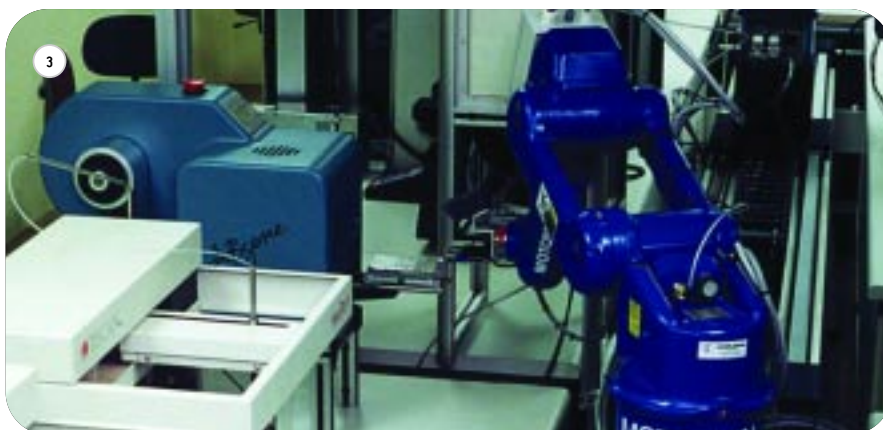
The Marshal System differs from other automated genetic typing laboratories in a number of respects. The analysis process of the system is seated in an input sample consisting of blood obtained through venipuncture spotted on FTA paper embedded in a barcoded Marshal Cassette. The Marshal Cassette is a custom designed device allowing for the spotting of blood on three disks of FTA paper at the point of sample collection (image 1). The collected blood sample dries within minutes of being spotted on the FTA paper, allowing for the safe storage and transport of the sample to the testing facility.

During manual processing of blood spotted on FTA paper, a specimen of 1.2mm in diameter is punched from a blood-spotted card into reaction tubes. The disks are then washed in sequential steps by dispensing a proprietary purification reagent into the reaction tubes, followed by vortexing and aspiration.

In the pre-amplification area of the Marshal System workflow, the sequence of events is reversed, in that the sample is first washed by vacuum-filtration in a robotic liquid handler, then dried in an incubator, before a specimen is punched into a barcoded Thermo-Fast® 96 Ultra Rigid Skirted PCR Plate (image 2).



Since sample tracking in the Marshal System is effected through barcoding of both samples and labware, irrefutable positioning of the punched disks in predetermined wells of the PCR plate is guaranteed. A second robotic liquid handler dispenses multiplex PCR master mix into the 96-well PCR plate. Finally, an articulated robotic manipulator, responsible for labware transfer, presents the prepared PCR plate to the ABgene® ALPS 300™ to be sealed with Easy Pierce Strong heat seal, and stored in a refrigerated carousel, should a re-run of a given sample be required.



Cat. No.	Description	Quantity
AB-0950	ALPS 300™ Automated Plate Sealer	1 unit
AB-3798	Easy Pierce Strong	610m roll
AB-3738	Easy Pierce	610m roll
AB-1000	Thermo-Fast® 96 Ultra Rigid Skirted PCR Plate	50 plates

Senior Superintendent Christo Weitz & Superintendent Johann van Niekerk

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In the AD area samples are amplified in a thermal cycler with robotic heated bonnets. A third robotic liquid handler effects a parent-child transfer of amplified DNA, and also dispenses allelic ladders, internal lane standards and formamide mixtures into a 96-well plate, now prepared for capillary electrophoresis in an ABI PRISM® 3100 genetic analyser. Minor modification to the door of the genetic analyser allows the plate to be loaded by a robotic manipulator. The parent plate, containing amplified DNA, is resealed on a second ABgene® ALPS 300™ with Easy Pierce heat seal, and stored in a refrigerated carousel, should a re-run of a given sample be required.

The Marshal System is capable of processing 440 reference DNA samples in 24 hours, given one 16-capillary genetic analyser. The entire process requires no human intervention, except for routine maintenance. This automated laboratory, currently in the integration and validation phase, will be commissioned in February 2002.

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