

## Features

### Speeding Up DNA Analysis

New technology may help labs clear backlogs, apply the tool more often to property crime investigations, and bring DNA analysis to the field.

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February 06, 2014 | by Annette Summers and Stephanie Yeung



Photo: Mark W. Clark

Current DNA testing and analysis methods present significant challenges for law enforcement agencies. High costs and the time required to process DNA samples have limited this scientific approach largely to felony crimes. Even with this constrained use, high volumes of samples are left untested for months or longer, leaving many crime labs with backlogs of evidence and hampering law enforcement efforts.

Delays in processing DNA evidence can leave suspects free to commit heinous crimes and cause your leads to grow cold. According to a study conducted by the city of Chicago, the inability to arrest just eight offenders on first capture allows another 60 violent crimes to occur. In addition, despite studies showing that DNA evidence increases conviction rates, law enforcement has had little opportunity to use this evidence for less serious crimes such as drug offenses and stolen property.

A report published by the National Institute of Justice (NIJ) found that laboratories processed 10% more forensic DNA cases in 2011 than in 2009. DNA backlogs (samples more than 30 days old) also continued to increase as demand for forensic DNA services rose 16.4% in the same period, and the demand continues to outpace capacity. The report concluded that reducing backlogs would require hiring additional DNA analysts, retaining trained personnel, and automating work processes.

#### Rapid DNA

New rapid DNA profiling technologies are emerging to help address these challenges. One system, for example, automates DNA profiling from a simple cheek swab, generating results in about 90 minutes. The "swab in, profile out process" takes less than five minutes of hands-on time, and performs all necessary steps of DNA analysis without human intervention. Reagents in disposable cartridges are loaded onto the

system with up to seven buccal (cheek) swab samples.

After a sample run is started, samples are processed with no further user interaction. The system extracts DNA and performs short tandem repeat (STR) amplifications, electrophoretic separations, and software analysis to generate full human identification profiles. The findings are then used to search the linked DNA database to find matching hits or compared to swabs taken from suspects. This integration enables law enforcement agencies to reduce the time it takes to generate a DNA profile and make decisions while arrestees are in custody.

Fears that rapid DNA instruments will replace crime lab jobs, however, are unfounded. In reality, as the demand for DNA evidence continues to rise, rapid DNA technology will greatly benefit crime labs through increased productivity.

### **In the Field**

Denver District Attorney Mitch Morrissey says the benefit of rapid DNA processing is that officers will be able to quickly identify persons arrested and that will reduce the strain on state resources. "The ability to know a suspect's identity within 90 minutes will change the whole legal argument when it comes to the constitutionality of taking DNA upon arrest," he adds

One of the most prevalent rapid DNA processing tools is The RapidHIT System by [IntegenX](#). The RapidHIT can be deployed as a mobile unit by techs and qualified officers in the field. Samples are also confined to the system during the analysis process, which improves sample tracking and establishes a clear chain of custody. As a result, evidence has a much better chance of standing up to scrutiny in court.

"We haven't changed the process of DNA profiling very much," says Dennis Harris, Ph.D., co-founder and chief scientific officer at IntegenX. "We have basically taken what they do today in the laboratory and implemented that in a single box." Harris says that the FBI would like to have one of these systems in every booking station in the country. The legislative environment for this already exists; 27 states now allow for arrestees to be swabbed for DNA at the time of their booking or charging.

### **Rapid DNA in Action**

The Palm Bay (Fla.) Police Department was the first law enforcement agency to partner with IntegenX. Palm Bay is a city of more than 100,000, and it was selected as an early site because it had developed an extensive local DNA database. After tracking crime rates through the database, the city's overall crime rate fell by 25%, with a 40% decrease in burglaries. The case clearance rate more than tripled to 35%, compared to a national average of 13%. The department is currently using the RapidHIT technology as an investigational tool for non-violent crimes, which account for roughly 80% of crimes in Palm Bay.

The RapidHIT System is currently being validated at the Arizona Department of Public Safety (DPS) in Phoenix, where it will primarily be used for the backlog of property crimes. Arizona DPS hopes to implement the RapidHIT System in the field during the first quarter of 2014. "The evaluations are going very well. These instruments are new and will need to be evaluated by labs before they are fully operational, but the outlook is extremely encouraging," says Vince Figarelli, superintendent of the Phoenix DPS crime lab.

Figarelli says he can also see the RapidHIT System used for other applications outside the laboratory such as identifying deceased victims at a medical examiner's office. "Family members can submit their DNA and within two hours, a relative can be identified. Right now families have to wait for dental records," he says. Figarelli also foresees officers collecting and processing DNA samples at crime scenes when there is enough sample to collect; for example, saliva from drinks or blood samples.

### **Integrating the Data**

In the U.S., state and local agencies currently use rapid DNA instruments with their own databases, which is what Arizona is doing. "Greater than 95% of our hits are within the state of Arizona," says Figarelli, "and the other 5% are usually hits within the national database, making it faster to apprehend a suspect."

Instrument providers are working with private database suppliers to create an integrated search capability that will allow customers to quickly search their local databases with crime scene samples and reference samples from arrestees (in arrestee states). This new level of automation, speed, and simplicity will enable a tremendous expansion of crime-fighting capability for law enforcement agencies worldwide.

The National DNA Index Service (NDIS) is expected to approve IntegenX's chemistries during the first half of 2014, which will allow the company to sell the product worldwide. These STR DNA profiling chemistries have already been widely used by forensic laboratories in their current DNA workflow, and agencies can take advantage of the technology without having to re-validate extensively.

### **Training and Validation**

In the near term, rapid DNA technology is being adopted by agencies that have databases for their jurisdictions. To ensure that the instruments, assays, and results are reproducible, training and validation programs are currently being designed in collaboration with users. Training programs have to be adapted from today's standard procedures because the instrumentation will be used by a broader array of personnel and under varying conditions.

Once the regulatory environment is in place, this technology will become more widely adopted and large-scale use will help bring down the cost per test, thus driving even broader adoption. This will allow law enforcement officials to take repeat offenders off the streets much sooner.

Meanwhile, counties that are able to find the resources to develop private databases for their jurisdictions can deploy the technology as an investigational tool. Several counties have used funds from the federal drug forfeiture program for this purpose. Grant funds are also available through the Department of Justice (see "[Rapid DNA: Finding the Money](#)").

More and more communities are realizing that the cost of using rapid DNA technology for property crimes is far less than the impact, financially and otherwise, that property crime has on law-abiding citizens. The public safety benefits are so great that communities across the U.S. are fast-tracking acquisition of the technology.

The National Institute of Justice estimates that the top 10% of burglars based on total activity commit 232 crimes each. The estimated cost of these crimes is \$491,608 per burglar per year. In addition, a 2007 study conducted by the Urban Institute–DNA Field Test reported that an individual DNA test cost approximately \$1,400; just 3% of the cost of a single prolific burglar in a year.

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Rapid DNA systems require a significant initial investment; however, there is strong pressure to budget for these initiatives given the reductions in personnel in major crime areas.

Because of the challenges that even the best labs face in maintaining a high-quality, reliable forensic workflow, the Department of Justice (DOJ) has spent more than \$500 million since 2004 to add infrastructure and IT systems to help reduce the backlog. Many laboratories have used the DOJ's grant program to purchase automation and database technologies. Other funding opportunities include Justice Assistance Grants and the COPS Community Policing Development program (also from DOJ), state and local grants with a law enforcement focus, and private corporate and family foundations. Many of these grants are focused on crime prevention, forensics, and the training required to install new technologies.

Rapid DNA technologies are strong candidates for grant proposals because they speed arrests and can potentially help communities reduce non-violent crime. When applying for grants, agencies need to assess and summarize their needs and explain how the project will be designed and implemented. It is also important to describe how the results will be monitored and reported.

When estimating costs, also include instrument and consumables, associated resources, and training costs required to run the system. Agencies can also search the Web for "law enforcement equipment grants" to find local and federal grant websites that provide guidelines for applications.

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