# DNA Technology as an Effective Tool in Reducing Crime

Mon, 10/01/2007 - 4:00am by Howard Safir

DNA evidence is one of the most effective tools available in modern law enforcement. For both violent and property crimes, DNA technology is often the critical factor in prosecuting the guilty and exonerating the innocent. Deployed strategically, DNA technology can improve prosecution rates, increase case clearance rates, act as a deterrent, and otherwise play a key role in systematic crime reduction. Conversely, haphazard deployment of DNA technology, namely focusing on the DNA laboratory alone without consideration of its role in the bigger picture, may lead to more work yet have little or no impact on the ultimate objective – reducing crime.

DEEPER INSIGHTS

The Importance of Mobile Forensics for Law Enforcement

Forensic

With recent advancements in both the underlying forensic science of DNA and its widespread application by law enforcement agencies throughout the United States over the last ten years, the amount of evidence requiring DNA testing has contributed to significant backlogs of forensic analysis throughout the country. As compared to even five years ago, today more material found at a crime scene can be probative which means more work to collect, process, analyze, and interpret results. This increased volume has a cascading effect both on the size of the reports and what is provided to prosecutors. Although many jurisdictions have taken proactive and strategic approaches and nationwide programs such as

the President's DNA Initiative have had an impact, significant CODIS and casework backlogs remain at all levels of government.

Data from numerous sources provide the necessary information to demonstrate a reduction in crime. As an example, according to the white paper "The Application of DNA Technology in England and Wales" by Christopher H. Asplen, J.D., the Forensic Science Services serving the England and Wales:

- Solves 0.8 other crimes for each crime solved with DNA
- Prevents 7.8 other crimes for each custodial sentence resulting from a DNA based conviction
- Increases the suspect identification rate for domestic burglary from 14 to 44 percent when DNA is available at the crime scene
- Maintains a 40 percent chance of obtaining a match between a crime scene profile and a "criminal justice" (arrestee or suspect) profile loaded into the database

An example in the United States comes from Denver which participated in a National Institute of Justice funded pilot study with four other cities. The study was to determine the effectiveness of DNA as a crime reduction tool by focusing on high volume crimes such as burglary, auto-theft, and theft from motor vehicle cases. According to a joint press release issued on June 10, 2007 by the Denver District Attorney and the Denver Police Department, Denver had the most hits on the CODIS (DNA database), cases filed with the DA's office, and the number of cases prosecuted. Some of the specific results noted included:

- Identified over 40 prolific burglars since the project started November 1, 2005.
- A prolific burglar commits an average of 243 cases per year.
- Of burglary cases where DNA is recovered, the prosecution rate is five times higher than cases without DNA.
- The average sentence for burglars linked to DNA is over 12 years in prison (compared to six months without DNA evidence).
- In a recent case, after police arrested one man (who later admitted to over 1000 burglaries), the burglary

rate in theWest Washington Park neighborhood dropped about 40%.

While it may seem from these two examples that crime is readily reduced with the use of DNA, obtaining the greatest benefit from DNA technology in reducing crime requires four critical elements: an integrated approach, critical feedback loops, measurement of progress and results, and effective processing of forensic DNA evidence.

**AN INTEGRATED APPROACH**

First, effective use of DNA requires an integrated approach. Efficiency and quality in the laboratory can only be achieved through changes to evidence collection and increased coordination with prosecuting attorneys.

For every individual case, the prosecutorial value of DNA evidence is only as strong as the weakest link in the chain from crime scene collection; handling and transport; forensic analysis and interpretation; and finally the resolution in the court of law. With the scientific basis of DNA identification long accepted, most defense bar challenges are limited to attempts to demonstrate (or suggest) human or procedural error.

As legislation, innovation, and funding have contributed to a substantial increase in the volume of DNA evidence over the past ten years, strategies and solutions that have and will continue to reduce crime must be guided by the fact that prosecutions are built one solid case at a time. In other words, the bottom line for any law enforcement officer, crime scene technician, evidence technician, or forensic analyst is to ensure that every time they collect, handle, transport, or analyze DNA evidence that they do so according to defensible procedures within accepted prosecutorial standards. However, all of these steps in the process are so interrelated that they not only have to be done correctly in and of themselves, but each step must also be in synch with the others as an integrated approach.

The federal government has recognized the need for an integrated approach by providing funds for training law enforcement officers in proper DNA collection and evidence handling alongside funding for state and local laboratories to decrease their backlogs both internally through capacity

building and externally through outsourcing to private laboratories. Furthermore, the federal government has developed training materials for prosecutors to better understand DNA and how to use it effectively in prosecuting a case.

Unfortunately, training programs from the federal government aren't enough. This training needs to be introduced in a coordinated manner at all levels. Each step in the process is highly dependent on all other steps being done correctly.

**THE CRITICAL FEEDBACK LOOPS**

Second, feedback loops must be built into the system. This includes crime scene technicians, DNA analysts, investigators, and attorneys. Marietta, OH 45750 740-373-6809

In order for an integrated approach to work in the most effective manner, feedback loops are essential throughout the entire process. As a case moves from the crime scene through case management to DNA testing, the information associated with the case is cumulative which provides a natural mechanism to communicate between team members.

**MEASUREMENT OF PROGRESS AND RESULTS**

Third, the impact must be measured and tracked. A comprehensive tracking system is essential to reach the ultimate goal of reducing crime.

Measurement of progress and results is the final element in the effective use of DNA to reduce crime. Gathering, tracking, and reporting these measures of progress were very effective in focusing all efforts on the ultimate goal of reducing crime.

In addition to the final result (e.g., number of convictions), the steps towards the conviction rate provide insight into how effective the process is and what methods are most effective in achieving the result.

**EFFECTIVELY PROCESSING FORENSIC DNA EVIDENCE**

Finally, DNA testing labs must push to process the high volume of evidence in the most efficient and effective manner possible. Recent innovative products can further integrate the collection, documentation, transport, storage, and analysis of samples to the point where it is now possible to collect, dry, and store samples in the same bar-coded tube in which the

sample is transported and ultimately used for processing in the lab. Not only does this reduce the time to handle the evidence at the crime scene and laboratory, but this fully integrated, solutions-based crime scene collector minimizes contamination, improves laboratory throughput/efficiency, and provides a chain-of-custody record and related procedures that meet or exceed prosecutorial requirements.

Although various state and local laboratories differ as to their technical standards, strategic approach, and case workloads, significant casework backlogs exist throughout the country. Unlike convicted offender databanking, however, the casework backlogs are more difficult to accurately quantify as it is not certain which or how many items of forensic evidence may contain biological samples until such items are analyzed. According to the Justice Department, as of 2002, the federal, state, and local labs reported a backlog of 500,000 requests for forensic analysis.

Concerted initiatives to apply funding and programs to analyze these cases have yielded significant prosecutions. For example, when I was Police Commissioner of New York City, I discovered that there was a backlog of 16,000 rape kits that were unanalyzed due to a lack of funding. We corrected that and utilized private laboratories to conduct the analysis over a three year period. While I worked in a city with a progressive mayor who possessed the desire and capability to tap financial resources to address this problem, not every police chief is in the same fortunate position. The most recent federal funding to analyze rape kits and evidence from other violent felonies has come from the National Institute of Justice as part of the President’s DNA Initiative.

But the funding to date has not been enough in that the casework backlogs have increased around the country. As discussed earlier, the number of cases from which samples for DNA testing has increased at the same time that the number of samples collected for each case continues to grow. While DNA testing capacity has increased in the last five years as a result of funding from the President’s DNA Initiative, the increased capacity has not kept pace with the demand. Simply continuing to further fund DNA testing without making substantive changes in how the evidence is processed will likely result in backlogs continuing to grow.

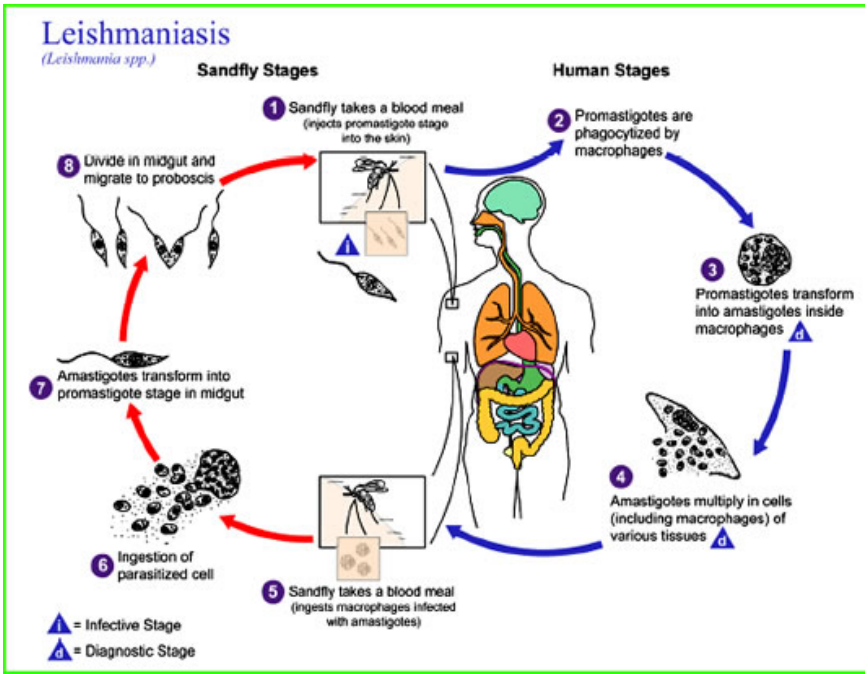
To eliminate the 16,000 rape kit backlog in a reasonable time frame required outsourcing to private laboratories and changes to how evidence is processed. If New York were to first try to build the necessary capacity to process the 16,000 cases in house, the backlogs would only continue to grow as the capacity was increased. Likely, the backlogs would continue to exist 20 years later using this approach. The most effective means to obtain immediate increased capacity was through out-sourcing to private laboratories. While all police chiefs would like to say that they can handle all DNA testing in house, we cannot wait the 20 or more years to build capacity while crimes continue to occur everyday.

Outsourcing was not enough though. We encouraged our outsourcing partners to offer innovative solutions to process the backlog in the most efficient manner possible. Our objective was to maximize the number of CODIS-eligible profiles in the shortest possible time. This is a fundamental change in forensic analysis as the traditional objective is to compare evidence to known standards. This change allowed the order of processing to be changed and the bottlenecks that laboratories typically experience were bypassed.

Traditionally, the samples are first screened for the presence of biological evidence to determine which sample(s) has the most available and therefore the greatest likelihood of providing a CODIS-eligible profile. The samples which indicate the greatest chance of success then proceed to DNA testing. However, if a full DNA profile cannot be obtained, then the process requires the analyst to go back to the evidence and try another sample. This order of processing has proved to be reliable for years and minimizes the number of samples that have to be tested for DNA.

However, this traditional process is markedly slower than if all evidence from all cases proceeded directly to DNA testing without initially being screened. To determine which samples should proceed through the entire DNA testing process, the amount of male DNA is quantified and only those samples with the most DNA available are completed. This process skips the screening step completely and completes the case the first time through (i.e. no need to return to the case for additional evidence). More importantly, the process results in more CODIS-eligible profiles since the amount of DNA is the primary means to determine which samples will yield results. The bottom line is that the cases were processed faster and

provided better results. With the combination of outsourcing and modifying the testing process, we were able to complete all 16,000 cases in less than three years.




Life Cycle of the Sandfly (Credit: CDC/Alexander J. da Silva, PhD/Melanie Moser)

**NYPD BIOTRACKS PROGRAM**

Another example of a successful program that illustrates the use of these four critical elements is the New York Police Department BioTracks program. Funded by the President's DNA Initiative, BioTracks started as a pilot focused on no-suspect property crimes with the objective of leveraging CODIS to identify recidivists and reduce crime. The goals of the program included:

- Demonstrate that burglary scenes have potential DNA evidence
- Solve no-suspect burglaries
- Establish links between cases
- Reduce rate of burglaries and ultimately more serious crimes

The program was designed from the beginning as an integrated process that starts at the crime scene and doesn't end until the case is resolved in the court of law. In order to do this appropriately, the team for the program included the following:

- Evidence Collection Teams
- Police Crime Laboratory Personnel
- Private DNA Testing Laboratory
- OCME Dept of Forensic Biology
- Detective Squads
- District Attorney

Each of these team members in the process needs to be knowledgeable of the entire process, the critical aspects of their contributions, and how their contributions fit into the process as a whole.

At the beginning of the process, the BioTracks program starts with training the evidence collection teams and crime scene unit. To control the expansion of the project, training began in a single borough in New York City. This allowed NYPD to standardize the training and make changes before expanding to the rest of the boroughs. These training sessions cover the basics of DNA; emphasize the wide variety of materials from which DNA can be obtained (i.e. cigarettes, drink containers, gloves, cords and ropes, tools, doors and windows, etc.); how to properly obtain both crime scene and reference samples and avoid contamination; the importance of chain of custody; and, finally, what happens after the evidence is submitted for testing.

The next critical point in the process is the handoff from the evidence collection technician to the New York Police Department which is responsible for case management:

- Determining whether evidence was probative vs. non-probative
- Determining the probable cause
- Processing clothing for hairs that are suitable for nuclear DNA
- Obtaining reference (i.e. elimination) samples from the victims
- Preparing cases for submission to the private DNA laboratory for testing

The above steps are highly dependent on the evidence collection teams from the crime scene unit to collect evidence appropriately as well as ensure that the DNA testing was performed on the most probative evidence and processed in a timely manner.

Following the DNA testing, the New York City Office of Chief Medical Examiner, Forensic Biology Division reviews the case files. Upon review, the NYC OCME uploads the DNA profiles to the local database to identify local matches and patterns, uploads CODIS-eligible profiles to identify state and national matches, and then notifies both the NYPD Crime Laboratory and the District Attorney's office of any matches.

The NYPD detective squad takes the match information and further investigates the case which often requires discussion with the DNA Analyst at the OCME. To prioritize the cases, the detectives discuss with the District Attorney's office the chances of obtaining a conviction. Ultimately to obtain a prosecution, the detective works very closely with the District Attorney in providing all the evidence. However, to get to the point of prosecution all team members must work together as part of the highly integrated process.

The first feedback loop occurs when a DNA profile from a case matches a DNA profile in CODIS (or local DNA database). At this point, the OCME generates a "match letter" which is sent to both the NYPD Crime Laboratory and the District Attorney's Office. By sending the letter to both agencies, the two agencies can better coordinate efforts in prioritizing the case and moving the case towards final resolution. NYPD has a stringent follow-up policy and provides initial reports on CODIS matches in fourteen days.

The second critical feedback loop is when a case reaches final resolution. At this point, the District Attorney's Office notifies the NYPD and OCME of the final outcome. While knowing the final outcome isn't essential to the process, each of the team members can be more effective by knowing the outcome, even if the case wasn't prosecuted. Knowing which cases resulted in a prosecution or not provides additional information that can improve how and what evidence is collected, how a case is investigated, how and what evidence is tested for DNA, and ultimately, how many cases result in a prosecution. While the match letter from the OCME is essential to move the case forward, the final result of the case is what leads to the ultimate goal of reducing crime.

Initial measurement of progress and results from the BioTracks program in Queens County only resulted in 71

convictions to date with another 90 arrests awaiting adjudication.

Some of the preliminary data from BioTracks includes:

- 3,430 crime scenes from which biological evidence was collected
- 6,391 items of evidence outsourced to DNA labs for testing
- 47% of the cases yielded a CODIS-eligible profile - Blood, cigarette butts, beverage containers, and hats provided the highest DNA yield - Windows, tools, doors, and rubber gloves provided the lowest DNA yield
- 32% of CODIS-eligible profiles matched to convicted offenders
- 15% of all cases analyzed yielded DNA which matched an offender
- Of the 161 arrestees to date, 54% had more than 25 arrests and 80% were convicted for violent felonies
- Approximately 450 case-to-offender hits matched approximately 350 offenders

This data indicates that burglary scenes do provide effective means of collecting DNA, particularly from blood, cigarette butts, beverage containers, and hats and solving lesser-offense cases. But also, the data shows that BioTracks has the potential to reduce crime and recidivism (e.g. 54% of the offenders had more than 25 arrests). Finally, the data makes a compelling novel argument for the utility of DNA on lesser crimes. The conventional thinking has been that performing DNA on lesser crimes will prevent future crimes by apprehending criminals before they graduate to more serious crimes. As noted above, 80% of the arrestees had been previously convicted of a violent felony. This suggests that the criminals have already graduated to more serious crimes and may be committing lesser crimes such as burglary in addition to serious crimes. Only time and measurement of results will tell whether the BioTracks program delivers the same results as those in the U.K.

**CONCLUSION**

In the last ten years, federal, state, and local law enforcement in concert with the forensic community has effectively convicted tens of thousands of criminals. DNA has been a critical tool to both increasing the number of convictions as

well as the certainty. While we have made tremendous progress, the backlogs continue to grow. To help jurisdictions throughout the country most effectively and efficiently benefit from both the current reality and future potential of DNA technology further innovative changes throughout the integrated process need to be pursued while continuing to leverage the feedback loops and measurement of progress and results to objectively quantify the impact in crime reduction.

*Acknowledgement: Data regarding the BioTracks program were presented by Sergeant Joe Blozis of the NYPD at the Sixth Annual Advanced DNA Technical Workshop in Captiva Island, Florida.*

*Howard Safir is CEO of Bode Technology and SafirRosetti, both companies of Global Options Group, Inc. Previously, Mr. Safir was the 39th Police Commissioner of the City of New York In his four years as Police Commissioner, he achieved a 38% reduction in major crime and reduced homicides by 44%, bringing the total number of murders in New York to 667, the lowest level in three decades. Mr. Safir received a B.A. in History and Political Science from Hofstra University in 1963. He attended Harvard University's John F. Kennedy School of Government, receiving certificates in the programs for Senior Managers in Government in 1988 and for National and International Security in 1989. Mr. Safir can be reached at editors@forensicmag.com www.bodetech.com*

DNA

## RELATED READS

### Briefs: A 2004 Cold Murder Case and DNA in Space

### Nanovaccine Could Enhance Cancer

Immunotherapy, Reduce Side Effects

Cleanrooms

Scan Tablet

Research Reveals Restorative Justice Reduces Recidivism