Benefits of Electronic DNA Sample Management
Maine Crime Lab Decides Electronic Solution Is BestFor Ensuring More Accurate, Streamlined DNA Sample Management

Many forensic laboratories are discovering that converting their DNA sample management from a manual to electronic process can yield several major benefits, such as improved sample tracking, more efficient work flow, increased throughput, more accurate reporting of results, and tightened chain of custody. Manual methods for achieving DNA sample management results can lead to errors in transcribed data, contributing to flawed results, which can hinder criminal investigations.

Most laboratories today have some level of automation, one of which is a Laboratory Information Management System (LIMS), designed for tracking evidence samples and work flows by providing essential testing tools for every stage of the work flow process. The LIMS aims to shorten the data path between instruments generating the analytical results, streamline data evaluation by scientists, and strengthen the subsequent reporting of results. Laboratories might also use a wide array of robots and various instruments, especially for DNA sample processing.

Two scientists in the Maine State Police Crime Lab unpack DNA profiling kits.

Completing Work Sheets Tedious With Manual Approach

The missing link within these solutions typically is an electronic solution for DNA sample management. This is what the Maine State Police Crime Laboratory, in Augusta, Maine, has discovered, and why it is presently preparing to install a highly customized software from Phoenix, Arizona-based JusticeTrax, called LIMS-plus DNA. This software would vastly improve a DNA laboratory's sample management process via several capabilities: tracking requests for analysis, analysts, groups assigned; customized analytical modules; evidence barcoding; tailored report templates; quality management via uniformity of information (recording use of test methods, training records, instrument validation); and improved documentation. The Maine Crime Laboratory's decision to make DNA processing electronic was influenced, in part, by the fact that the laboratory has been using its vendor's LIMS-plus software since 1999.

A forensic analyst prepares an extracted DNA sample.

Prior to the laboratory's adoption of a LIMS, every activity tied to evidence processing was done with paper and carbon copies. David Muniec, Forensic Biology Supervisor for Maine State Police Crime Laboratory, called the manual system "atrocious." Although the LIMS software has eclipsed the manual system in efficiency, higher accuracy, time savings, and more reliable data entry and reports, filling out DNA analysis work sheets remains a manual process. "Right now, we have paper work sheets," Muniec said. Therefore, as an example, when a scientist is working with a particular case number and has evidence items associated with it (i.e., item 1, item 2, item 3), he or she has to write these onto every work sheet for all of the steps in the DNA analysis process--extraction, quantification, amplification, and detection. For this very reason, Muniec says he looks forward to implementing the LIMS-plus DNA software "so that when you have to fill out a work sheet, you only have to type in the information once. Then the correct item numbers and case numbers just keep carrying through from step to step, work sheet to work sheet," Muniec said. "Ideally, at the end, you'd also have

an automated way to print out your DNA profile instead of transcribing it, and then importing your DNA profiles into CODIS."

LIMS Integration Needed

Although all operations within a crime laboratory are important, those associated with DNA sample management are especially so because human lives and innocence or guilt of a crime may be at stake. Once evidence comes into a lab, it is assigned a case number and an item number. "If we could have a system (i.e., LIMS) integrate this information from an electronic DNA sample management solution, then when the DNA analyst wants to work with his pick list—items 1,2,3, etc.—the work sheet is automatically populated," Muniec explained. "That's the best of all possible worlds instead of sitting at a computer and typing this out manually.

If you create an error at the beginning using a manual system, it's going to perpetuate itself." When mistakes occur using a manual DNA sample management approach, a corrected or amended report must be generated. "It all gets to be very confusing," Muniec said. "You have to worry if people have the right report."

Electronic Solution Would Benefit Many Stakeholders

Another reason for Muniec's concerns and his desire to make DNA sample management electronic is that his laboratory works with numerous law enforcement agencies connected with criminal investigations, identification of human remains for the medical examiner's office, and uploads of DNA profiles from convicted offenders collected by probation officers and the state department of corrections. "If you automated all of this and eliminated as much repetitive, manual data entry as possible, even little errors, you've just made the DNA process a little bit quicker, and you've also increased by many times-fold the reliability," Muniec said.

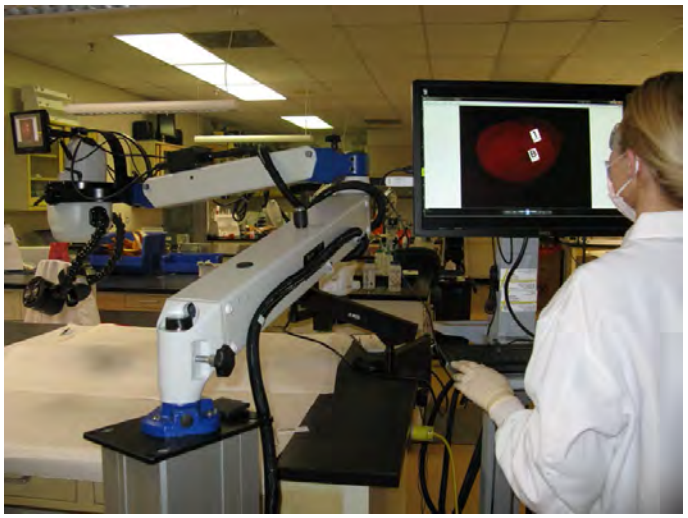
An analyst examining a carpet sample for blood.

Staying With One Vendor Yields Software Continuity

The Maine State Police Crime Laboratory feels it is plausible to adopt an electronic DNA sample management solution from the same vendor who has provided its LIMS. A main reason is the need for eventual integration of the LIMS and DNA software programs. Using a totally different vendor could be very risky. Even if, say, an alternate DNA sample processing software did work, when it came time to migrate to the next version of the LIMS software, "you'd have to recreate the whole effort to accomplish integration," Muniec said. Mixing and matching different software also can possibly boomerang on a laboratory regarding service and support, meaning this could involve renewed software evaluation and purchases. Furthermore, there are budgetary constraints for many labs with their purchases of software and equipment because there often are free upgrades provided by the software vendor. Working with the same vendor throughout any new software purchases is optimal. No laboratory wants to buy new software every five or ten years. Instead, upgrading the software is preferred since the vendor can keep the software operating and current.

It's not enough just to have a LIMS in forensic laboratories for tracking evidence samples because of the increased emphasis on DNA sample management. Converting from a manual DNA processing system to one that is electronic is crucial to assure fewer data entry errors and strong chain of custody, but also to integrate with an existing LIMS. Such a dedicated electronic solution for DNA processing can prevent many invasive issues from interfering with work flow and throughput. These are:

*Problematic error checking
*Inability to effectively track samples
*Cumbersome documentation
*Inability to prevent, track, and correct transcription errors
*Multiple data inquiries
*Complicated peer review process


An analyst examining evidence for biological fluid using UV light technology.

An electronic solution for DNA sample management will grow as a laboratory grows and as its needs increase. Integral to this growth is the software's ability to be customizable to the laboratory's specific methods, protocols, instrumentation, and other operations. After all, said Maine State Police Crime Laboratory's Muniec, "The report is the end product. It's what we send out. The report is paramount because it's tied to everything we do and to the impact and repercussions this has on people's lives—for the victims, perpetrators, and for the innocently accused."

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