A69 A Sample Tracking System to Automate and Increase Workflow in a Forensic DNA Casework Lab

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After attending this presentation, attendees will understand the steps needed to create and use barcodes with a sample tracking system in a high-throughput, automated forensic DNA lab. The audience will be led through casework examples using the HCIFS Forensic Biology Laboratory system as a model and be shown that this type of system used with barcode-labeled samples will increase efficiency, limit human error, and help ensure the integrity of each sample.

This presentation will impact the forensic science community by demonstrating how barcode labeled samples and a sample tracking system can increase laboratory efficiency and decrease human error during DNA processing. This type of system will benefit the criminal justice community by demonstrating a way to ensure the integrity of casework samples while providing a step by step snapshot of the automated verifications performed throughout our DNA testing process.

Tracking samples correctly and efficiently is a critical priority that becomes increasingly difficult with increases in caseload. In a batch-testing system, quality concerns increase as batch sizes increase. Verifications are required for each tube change and each time a plate is moved to a new station. Manual verification (i.e., by a second analyst) of casework samples tends to be time consuming and requires second analysts to be available to verify that paperwork and labels match. This is inefficient as well as a source of potential error. Barcode labeled samples, in conjunction with a sample tracking system, help reduce labeling errors and provide automated verification.

The HCIFS Forensic Genetics Laboratory currently utilizes an electronic LIMS to track the chain of custody of evidence *items*. However, the LIMS does not track evidence *samples* throughout the DNA process. To overcome this limitation, the HCIFS Forensic Genetics Laboratory designed and implemented a sample tracking system that generates a barcode for each sample and utilizes a SQL database to maintain the sample information. The system reduced the number of second analyst verifications from approximately twenty to one.

Within the laboratory, twelve barcode stations are set up to quickly and efficiently label samples. Each station consists of a barcode printer, a scanner with 1D and 2D capabilities, and either a desktop computer or a mobile tablet with sample tracking software installed. The software was written to allow us to alter and customize it to accommodate evolving manual or robotic procedures. The sample tracking system generates a 1D and a 2D barcode label for each sample that enters DNA processing. The barcode label is scanned and tracked electronically from that point forward. The system allows samples to be prioritized (e.g., stat. rush, normal) and then orders them by the date they were entered into the database. Batches are compiled by the analyst based on these criteria. Manual, second-analyst verifications have been replaced by automatic verification as the analyst scans the source tube and then the destination tube to ensure that labels match before transferring a sample. The system has numerous safeguards to prevent bypassing mandatory verifications or incorrectly scanning a sample. For example, if an analyst tries to scan the same tube for both the source and the destination tubes on a tube transfer verification, or the analyst scans the top label twice on a label verification, an error message will appear alerting the analyst that the verification failed and won't allow the process to continue until the verification is successful. Database management procedures are also included with the sample tracking system so that cases can be closed and stored in a separate database to prevent the program from running slowly.

To further automate the barcoding and sample tracking, the software is used with liquid handling robot with an integrated barcode scanner. This allows the robot to identify the position of each sample on the deck according to its barcode; the user does not prepare a fixed-order list of samples to begin the process. A full description of the sample tracking system and how it integrates into an automated lab will be presented.

Sample Tracking, Barcodes, Automation

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