EVIDENTIARY AND REFERENCE SAMPLE STABILIZATION AND RECOVERY DEVICE FOR SUPERIOR FORENSIC DNA SAMPLING, STORAGE AND PROFILING

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The tools used for crime scene and reference sample collection continue to be rigorously scrutinized and often successfully challenged in criminal cases in courts of law nationwide and globally. Maintaining the integrity of evidentiary and reference samples until DNA analysis is performed continues to be a major challenge - especially when samples stay in transit during transportation and or need to be stored for extended periods, which can be hours to months. Ultimately, problems associated with collection and storage of reference and evidentiary samples can be summarized as issues with sample quality, sample integrity during transport, processing cost, and lead time. These factors can separately or collectively impact the outcome of prosecutions, and the overall cost associated with the legal process. Thus, there is a crucial need for a cost-effective, efficient DNA collection and storage system that can significantly improve on the current sample collection tools, by maintaining sample integrity from collection until processing, maximizing sample recovery and compatibility with downstream DNA forensics profile analysis, while providing a means to ensure proper chain of custody.

Mawi has developed a sample collection system called iSWAB-Forensics, which is designed to be utilized indiscriminately for both reference and evidentiary sample collection. iSWAB-Forensics enables the long term room temperature stabilization of the collected sample at the point of collection. The sample recovery from the swab is achieved by including a squeezing insert within the device that allows for the maximum release of the collected sample from a swab holding evidentiary or reference samples into a proprietary DNA stabilizing buffer.

Several reference and mocked evidentiary samples (dry blood, fresh blood, buccal, lipstick, semen, touch DNA from a water bottle, steering wheel etc.) were collected with iSWAB-Forensics and transported to BioChain utilizing the standard US postal services system. At BioChain, the samples were aliquoted in 100 µL volumes and stored at room temperature until processed. BioChain processed the samples on their automated DNA purification system, AnaPrep, utilizing their blood extraction protocol. The samples were processed 3 days and 15 days post-collection. All samples had detectable and quantifiable amounts of human gDNA (Nanodrop and Investigator Quantiplex Kit). There was insignificant human gDNA loss between samples processed 3 or 15 days post collection. The functionality of the AnaPrep purified samples were successfully analyzed with the Identifiler® kit. In conclusion, the iSWAB-Forensics is an efficient recovery and stabilization sample collection tool for both reference and evidentiary samples. Also, the AnaPrep automated extraction system can be utilized for DNA sample processing in a forensics setting. Future work will be focused on two areas: 1) Compatibility of reference samples with direct PCR technologies; 2) The level of sensitivity and efficiency of iSWAB-Forensics for sample collection and recovery of low copy DNA samples.