OPTIMIZING FRONT-END DNA RECOVERY FOR IMPROVED DNA TYPING SUCCESS

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As the sensitivity and specificity of DNA typing multiplexes continues to increase, the role of the crime scene investigator becomes increasingly important. Adequate and appropriate collection of relevant biological samples is fundamental to the DNA typing success of the crime scene evidence. In recent years, there has been a shift from using traditional cotton swabs to novel collection devices, such as nylon materials and other recovery devices. Although the DNA yields have improved, the process from sample collection through extraction to generating a DNA profile is still quite long, and minimizes the overall throughput capabilities of the forensic laboratory.

In recent years, a shift to direct-to-PCR approaches has been initiated with the goal of increasing throughput of select investigative samples. Not only has instrumentation been developed that focuses on generating an on-the-spot DNA profile in as little as two hours, but new approaches to sample collection have also been refined. Collection devices such as the COPAN microFLOQ® direct swab have been developed to recover minute amounts of DNA that are ideal for direct-to-PCR workflows, thereby reducing the time necessary to generate a DNA profile. However, little is known about the actual amount of DNA collected on and subsequently recovered from the surface of these devices, where oftentimes analysts collect too much DNA and oversaturate DNA typing systems.

This study investigated the quantities of DNA recovered from a variety of biological fluids (e.g., blood, semen, saliva) and touch objects consistent with forensic biologic substrates recovered from a crime scene. Although minute amounts of cellular material were recovered, full DNA profiles with sufficient quantifiable DNA were obtained using both PCR-CE and MPS forensic workflows. Further, the quantities of DNA recovered from each sample type demonstrate how use of a collection device such as the COPAN microFLOQ® direct swab can be ideal for rapid crime scene sample processing using direct-to-PCR workflows. Overall, these findings illustrate that although DNA profiles can be exacerbated by oversampling using a direct-to-PCR collection device, an ideal range of DNA is achievable, making micro-collection devices suitable for streamlined forensic DNA typing of forensic biological samples.