



D31 Forensic Devices for Maximizing Crime Scene Sample Procurement

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After attending this presentation, attendees will understand the importance of innovative collection devices for recovering and preserving DNA traces for crime scenes investigation.

This presentation will impact the forensic community by introducing innovative and more reliable devices for collecting and preserving small amounts of DNA for profiling. It will show how cotton, polyester, rayon, or paper swabs are widely used for evidence collection from crime scenes; however, swabs can affect the evidence obtained and subsequently analyzed. FLOQSwabs™ (FFS) are specifically designed to facilitate and maximize crime scene sample collection, and neutralize microbial contaminants while preserving nucleic acids (NA) integrity without the need for drying the swab prior to transport or storage. Each forensic collection kit consists of specially designed regular, flat, round/rims, or nails flocked swabs associated to a Nucleic Acid Optimizer (NAO), a semi-permeable basket that allows efficient release of all sample collected from small traces during a crime scene investigation.

The objectives of this study were to: (1) compare the 4N6 FLOQSwabs™ collection kits (FFS+NAO) to traditional forensic collection devices for procurement and preservation of nucleic acids for forensic investigation; (2) to validate the FFS ability to preserve nucleic acids in samples with a heavy load of bacterial flora; (3) to validate the quality of nucleic acid for profiling; and, (4) to validate the ease of use of the special designed FFS for sample collection.

In this study crime scene traces (n=13) were simulated in the laboratory and included: Seven dry blood traces spotted on different types of surfaces including two with strong bacterial contamination; four sweat traces on different types of surface; one saliva trace on bottle necks; and one human skin trace under fingernails. Six replicates were prepared for each trace and duplicate samples were collected with FFSs, and traditional rayon forensic (RFS) (Sarstedt), and absorbent filter paper forensic swabs (PFS) (Whatman). Each swab was pre-wetted with 50ul of sterile distilled water. All samples collected were stored 10 days at room temperature and then tested for DNA quantity and quality for profiling. The FFSs were used in association with the NAOs during the purification procedure in order to completely drain the swabs after the lysing step. Nucleic acid was extracted with DNA blood mini elute, quantified by Real Time PCR, and profiled with a amplification kit.

In all the samples tested, the Copan FFS recovered from blood, saliva, sweat, and skin under nail traces 0.20ng/ul, 0.83ng/ul, 0.15ng/ul, and of 0.3ng/ul of human DNA, respectively, compared to 0.15ng/ul, 0.07ng/ul, 0.05ng/ul, and 0.06ng/ul of human DNA for the RFS and 0.0097ng/ul, 0.01ng/ul, 0.0033ng/ul, and 0.0044ng/ul of human DNA for the PFS, respectively. When comparing the total qPCR results, Copan FFSs recovered an average of 0.24ng/ul of human DNA compared to an average of 0.106ng/ul for the RFS and of 0.0072ng/ul for the PFS. From two heavily contaminated blood traces, FFS detected 0.61ng/ul versus 0.014ng/ul for RFS and 0.0ng/ul for PFS. Copan FFS collected 2.26 times more DNA than RFS and 33.3 times more DNA than the PFS.

When analyzing the STR profiles, Copan FFSs recovered from blood, saliva, sweat and skin under nail traces respectively 85.90%, 100%, 57.40% and 93.80% of the total alleles amplified, compared to 72.10%, 93.80%, 21.10% and 26.60% recovered by RFS and 24.30%, 31.30%, 0.40% and 4.90% recovered by PFS.

The 4N6 FLOQSwabs™ easily collected all samples from all collection sites due to the specially designed geometries. The traditional swabs performed fine but were limited due to a single geometry, shredded during collection, and did not have a transport tube.

Copan forensic collection kits are increasing and preserving DNA collection from 2.2 to 33 times and increasing the percentage of recovered alleles in STR analysis. The FFS can be used for sample collection in a heavily contaminated environment even after 10 days storage at room temperature without the need of drying. The FFS were easy to handle especially for the hard surfaces, bottleneck, and under nail collection.

FLOQSwabs, Forensic, Collection