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COMPARISON OF COPAN 4N6FLOQSWABS™ TO SWABS CURRENTLY IN USE FOR CRIME SCENE EVIDENCE COLLECTION

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INTRODUCTION

The ability to properly collect and transport biological material from crime scenes is important for samples preservation for successful forensic DNA detection and profiling. Crime scene samples are typically collected with DNA-Free cotton swabs, which raise two concerns. One, the ability of the collection device to absorb and preserve biological materials, the other how well the human cells are preserved on the device until DNA examination. Copan 4N6FLOQSwabsTM (4N6FS) and Nucleic Acid Optimizer (NAOTM) are innovative devices for crime scene evidence Collection. The 4N6FS are consisting of nylon fiber strands attached to molded plastic, and have high hydrophilic activity that allows efficient sample collection and release (Fig. 1).

NAO™ consisting of a semi-permeable basket, inserted in a 2 ml microtube, is used with the 4N6FS to efficiently release all sample. 4N6FS and NAO™ are produced only by profiled staff, are ETO treated and free of detectable DNAse, RNAse and free of amplifiable human DNA. 4N6FS are produced for Genetics and Crime scene, the latter treated with a bacteria static agent to prevent microbial proliferation.

Fig. 1 Characteristics of Copan 4N6FLOQSwabs™.

OBJECTIVES

1. Compare the 4N6FLOQSwabs™ to the swabs currently in use for traces collection on different materials or objects retrieved from crime scene for investigations .
2. Evaluate the performance of the 4N6FLOQSwabs™ used dry or wet and with and without the NAO™ for touch DNA collection.
3. Test preservation capability of 4N6FLOQSwabs over time.

MATERIAL AND METHODS

Traces (N=200) of different nature were selected. For each kind of trace, one were collected using the 4N6FLOQSwab™ and another with the swabs currently in use. Samples were divided according to the nature of the trace and extracted using different DNA extraction methods: Biorobot EZ1 (Qiagen), Maxwell 16 (Promega) and Chelex 100 (Bio-Rad). DNA was quantified with QuantifilerDuo Real time PCR and amplified with NGM SElect Express on Veriti 96 Well Thermal Cycler. Fragments were then distinguished using ABI 3500xL.

A total number of 50 mock samples for fresh body fluids, dry body fluids and touch DNA were prepared and collected using wet 4N6FLOQSwabs™, wet 4N6FLOQSwabs™ with NAO™ basket, dry 4N6FLOQSwabs™ and swabs current in use. Sample were extracted using biorobot EZ1, quantified using QuantifilerDuo DNA quantification kit, amplified with NGM Select Express and run on ABI 3500xL.

Antimicrobial activity was tested preparing mock samples for semen, saliva and blood, collecting them using 4N6FLOQSwabs™ and preserving swabs for three weeks at room temperature. Samples were analyzed at baseline and every week to verify non-loss of DNA.

RESULTS AND CONCLUSION

Data obtained from analyses on the 200 selected traces demonstrated an increased recovery efficiency of biological material by the 4N6FLOQSwabs™ compared to the swabs currently in use, especially when tested with the NAO™ basket. This is confirmed for all DNA extraction methods (fig.2). Touch DNA collected on hats, gloves and shirts using 4N6FLOQSwabs™ and other swabs were compared and results shows an improve of recovery and sensitivity for Copan swabs against swabs currently used, for touch DNA traces (Fig3).

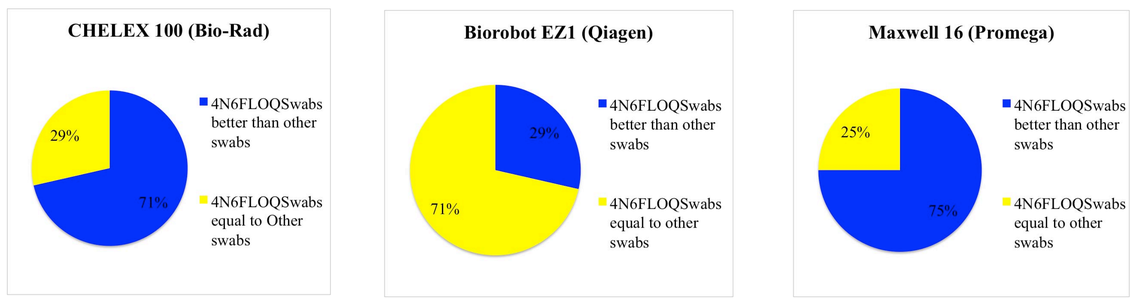

Fig. 2. Comparison of 4N6FLOQSwab™ to other swabs current in use with different DNA extraction methods.

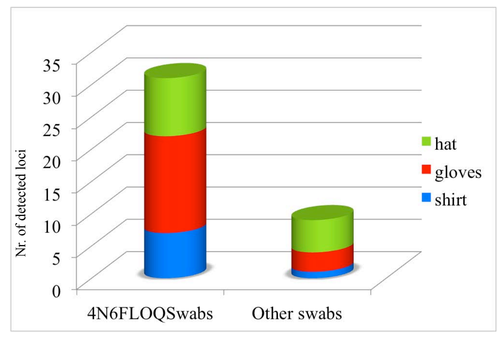

Fig. 3. Comparison of 4N6FLOQSwabs™ to other swabs for touch DNA recovery and sensitivity.

Wet and dry 4N6FLOQSwab™ were compared for the collection of blood, saliva and semen traces, wet or dry, and sweat traces; evidence shows that wet swabs are better for the collection of body fluids while dry one are better for touch DNA (Fig. 4). In every situation recovery using 4N6FLOQSwabs™ is greater than swabs current In use.

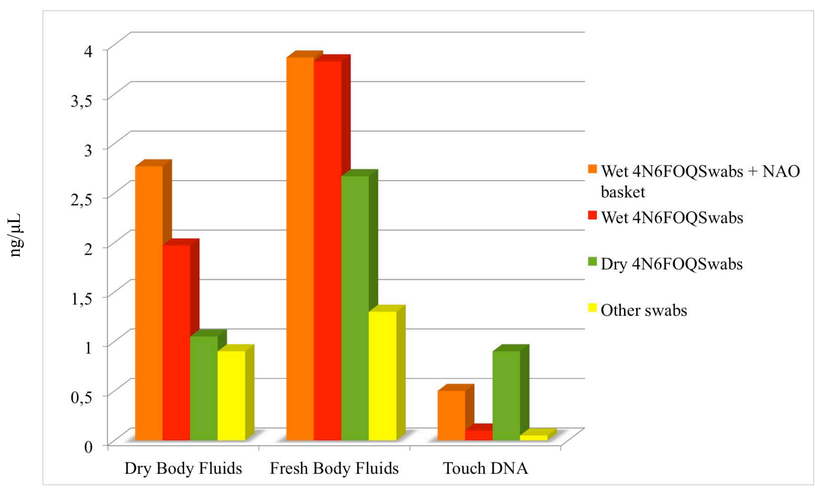

Fig.4. Quantification data obtained from body fluids and sweat traces.

At last 4N6FLOQSwabs™ were used to collect different body fluids and, left at room temperature for a maximum of 21 days, were analyzed every 7 days to evaluate the capability of DNA integrity preservation. Quantification results shown below (Fig. 5) demonstrated that the quantity of biological material remain almost the same during the analyzed period, thanks to antimicrobial treatment of 4N6FLOQSwabs™. The 4N6FS was then compared to other swabs provided with active drying agent for antimicrobial activity and results are shown in Fig.6.

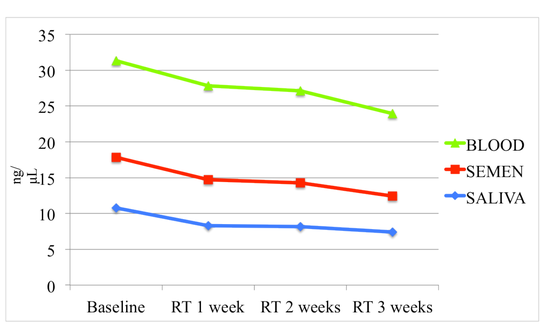

Fig. 5. Antimicrobial activity of 4N6FLOQSwabs™.

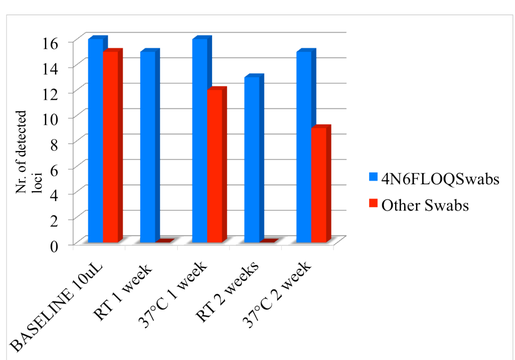

Fig. 6. 4N6FLOQSwabs™ compared to other swabs for antimicrobial activity.