CPA300™, A FULLY AUTOMATED SYSTEM THAT FACILITATES DNA DATA BANK TESTING

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Background: DNA data banking protocols have been established in centralized laboratory worldwide. Collection and handling of many thousands of DNA samples have become a common occurrence in forensic laboratories, therefore Automation of DNA banking can dramatically increase throughput, eliminate clerical errors and improve the productivity of forensic laboratories. Buccal or blood samples for data banking are collected and deposited on cards for easy storage, transport, handling and testing. Copan introduced the NUCLEIC-CARD™ collection kit, made by a flocked buccal swab sample collector, a barcoded color indicator card with separate sample storage and cleaning sections, and a plastic device to store both the card and the collector. It is a very innovative device for sample collection, storage and handling for DNA data banking. To facilitate the daily processing of the enormous number of cards, NewLab engineering, a division of Copan Italia, developed the CPA300™, a fully automated punch system for processing buccal and blood sample card for human DNA profiling. The CPA300™ is a walk-away system that integrates sample cards punching, master mix dispensing, plate sealing, and plate and/or data transfer to the PCR instrument. The CPA300™ can process up to 300 cards stored in 4 racks of 75 cards each and up to three 96-wells plates.

Objectives: To validate all the features included in the CPA300™ workflow in order to facilitate processing of blood or buccal sample deposited on cards to the forensic laboratories.

Method: In this study both single and double sample deposition area colored NUCLEIC-CARDs, with dedicated cleaning area, with and without samples were used. The validation process was done as follows: calibration of plate position and direction, card type selection (single or double, cleaning area or cleaning card); sample detection on the card (using the color contrast on the card), pipettor check, presence of disk inside the well, testing of the software by reading the card barcode and positioning and mapping of the sample in a plate well. The detection of the sample on the card was done with an industrial grade camera and a custom computer vision algorithm. The presence of the paper disk in the well is checked by taking pictures of the well before and after depositing the punch in that well. The absence of paper disks jumping from one well to another was checked. Once all the cards had been punched as per established protocol, the plate was transferred to the filling station for the master mix addition to each well and (optionally) of positive and negative control liquids in the designated wells. The plate was sealed and ready to be transferred to the PCR instrument. The plate worksheet with the processed cards' IDs was transferred to the sequencer either by LIS interface, or with the aid of a USB flash drive. Plates containing sample disks were tested for the presence of profiles. Repeated punching of the same card was performed, using the algorithm for detecting the old holes and selecting different punching positions.

Results and conclusions: All the features of the CPA300™ passed the validation process. No occurrence of disk jumping to another well was detected. Proper profiles were obtained from plates containing punches of blood or buccal samples. Sample position on the card was always identified. Only a partial profile was generated from the first cleaning punch, and not a single allele was generated from the second cleaning punch. These findings demonstrate that the

CPA300™ system can be used in a forensic laboratory to process a large number of samples for data banking and forensic case work samples. Further validation of the CPA300™ by a forensic laboratory is essential.