

INCREASING BUCCAL SAMPLE COLLECTION EFFICIENCY AND DNA (STR) PROFILE FIRST PASS SUCCESS RATES: A STUDY INTO COLLABORATIVE PRODUCT IMPROVEMENT

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Buccal sample collection is routinely used by the forensic community as a non-invasive way to obtain reference material for the purpose of human identification. A number of commercially available solutions are currently available, ranging from cotton swabs to solid support matrices contained within specifically designed collection units to capture sample DNA. Such collection products provide a medium for the preservation of sample DNA until it is processed. Buccal collection systems, such as Easicollect™, containing chemically modified matrices, include additional advantages to simultaneously capture, lyse and preserve samples for long term storage and future testing. First pass success rates of such collection products i.e. samples providing sufficient quantity and quality that result in a loadable DNA profile to a database first time; are important, as decrease in first pass rates, increases costs to the laboratory in terms of reagents, labour time costs, creating delays in criminal investigation or in cases of mass disasters, victim identification.

The EasiCollect™ collection system enables buccal sample collection and transfer to treated FTA™ paper to occur in a single device. Through customer feedback it was recognised that opportunities exist to update the device design and further improve first pass success rates. A study was commissioned engaging members from a global base of forensic science laboratories with GE Healthcare's Forensic Science Centre of Excellence, based in Cardiff, UK. Through this collaboration, design and usability features critical to end user success were identified. Utilizing six sigma techniques, features were weighted in order of importance and new design concepts, ranked accordingly. Concepts with the highest ratings were generated by 3D printing and sent to laboratories for feedback. Following a series of modifications based on this feedback, beta prototypes were manufactured, internally tested, and sent to forensic collaborators for independent assessment. Returning data measured usability and STR profile results such as average allelic peak height and first pass success rate.

Model data demonstrated a significant increase in performance for the prototype design when compared to the current product. Data generated by third parties confirmed improvements to first pass success rates and usability. Implementation of the product design will aid effective sample collection and increase DNA profile first pass success rates, reducing re-analysis time and costs.