# NON-DESTRUCTIVE, ENHANCED COLLECTION, RECOVERY AND STORAGE OF DIFFICULT FORENSIC SAMPLES, IMPROVING THE 'FRONT END' PROCESSES OF DNA TYPING

Steven B. Lee, DeEtta Mills, Juian Mendel, Joseph Rahm, Meghan Roig and Bruce McCord
Florida International University and San Jose State University

The challenge: Forensic evidence samples such as touch DNA samples, pollen grains, and other trace evidence are often encountered at crime scenes. The collection of trace samples can be a challenge especially if the evidence is found in difficult to get to areas such as cracks, under wall molding, on rough surfaces or even on clothing without destroying the surfaces. Trace biological evidence often produces low DNA yields and often a decision has to be made for recovering the DNA from an object or perhaps collect other trace evidence (latent print, etc.). Moreover, many security-related biological samples (e.g., biothreat agents, soils, powders) encountered in the field of counter-terrorism are also found at trace levels. To increase recovery of the cells and DNA a comparison was made between the prototype Venturi Vacuum Device (VVD) versus swabs. This field portable VVD collects directly onto a matrix so no need for additional filtering or handling as the matrix itself can go directly to DNA processing. The advantages of using the VVD are: (a) it is sterile, and disposable to prevent any cross contamination, and field portable. (b) It can be fitted with different collection tips to collect various sample types (cells, pollen, powders, bodily fluids, etc.) found in difficult to reach/access locations or crevices. (c) It can be used either in a wet or dry mode.

In our laboratory, we performed a study on touch samples from 100 individuals, the current prototype used a 1.2 uM polycarbonate filter on a suction cup tip to collect cells from stainless steel bars held by each individual. The filter captured the cells from the touched object, and the filter was then subjected to DNA extraction to compare various extraction methods, including enhanced recovery using pressure cycling technology (PCT). Individuals were asked to refrain from washing their hands for at least three hours before holding a stainless steel bar for 2 min. Cells were collected with the VVD, extracted and quantified. The average DNA yield from the 100 subjects collected was 2.2 ng with a range of ~0.008 ng to 35 ng. In addition, the VVD has been used to recover pollen from clothing. Additional experiments are ongoing that will assess the VVD's ability to capture cells from rough surfaces such as bricks and various types of ropes. Since samples once collected are often not analyzed for many months later we are also evaluating the use of chemical matrices to stabilize collected samples, their resulting DNA extracts and any impact of the matrices on downstream amplification. In addition, enhanced DNA extraction protocols using alkaline lysis and pressure cycling technologies, and direct PCR from collection matrices will also be tested for collective enhancement to yield and typing.