H20 Comparison of Extraction Methods From Cotton Swabs in Reference to Background DNA From Commonly Touched Surfaces

Meghan Roig, BS, Florida International University, 11200 SW 8th Street, Miami, FL 33199; Thais Simoes, Florida International University, 11200 SW 8th Street, Miami, FL 33199; Bruce R. McCord, PhD, Florida International University, Dept of Chemistry, University Park, Miami, FL 33199; and Kerry Lynn Opel, MA, PhD, Upper Iowa University, PO Box 1857, Fayette, IA 52142*

After attending this presentation, attendees will have a greater understanding of background touch DNA, the variation in quantities of DNA on different surfaces over time, and methodology for DNA extraction from cotton swabs.

This presentation will impact the forensic science community by providing information regarding levels of background DNA as well as by discussing swabbing and extraction methods. This presentation will improve understanding of the levels of background DNA on touched objects as well as demonstrate a novel extraction method.

With every touch of the skin to a surface, cells are left behind; with every cell, the genetic code can be found. People touch doors, tables, and so many other surfaces every day, often with multiple people touching the same object through the course of a day.[1] When a swab is used for evidence collection from a surface, the investigator may not know how many people may have touched this evidence in the past or what level of persistence DNA may have on touched objects over time. Though every touch leaves cells containing DNA, most contact leaves only a few cells if minimal pressure is used. These trace levels of DNA may remain undetected or, if detected, may be at such low levels that only stochastic effects and low levels of allele drop-in are seen.[2] Thus, it is important to understand general levels of DNA on commonly touched objects. To complete this properly, it is important to optimize extraction efficiency and to maximize DNA recovery from swabs. Therefore, levels of DNA on commonly touched objects are being investigating.

In this project, various surfaces were swabbed with a damp cotton swab, including bathroom door handles, benches, public areas, and household items. The DNA was extracted using standard phenol chloroform extraction along with alkaline lysis and Pressure Cycling Technology (PCT). A variety of different conditions were examined and optimized. For the PCT extractions, temperature, pressure, and time were investigated to increase the quantity of DNA resulting from the touched surfaces.[3] Alkaline lysis methods were also examined to improve recovery of DNA from swabs. This procedure was optimized by determining the effect of time and temperature on the recovered DNA. The quantity of recovered DNA was determined using real-time Polymerase Chain Reaction (PCR) with *Alu*-based targets and SYBR green detection. The samples were also analyzed using capillary electrophoresis-based Short Tandem Repeat (STR) typing to determine the percentage of recoverable alleles.

Touch DNA is an emulation of the Locard exchange principle, in that any time a person is in a location, that person may leave evidence of their presence.[1] The key issues are what levels of DNA can be found on everyday touched objects and how long do such levels of DNA persist following the incident. Results will be shown from a variety of surfaces found in public and private areas.

Reference(s):

1. Chisum W.J., Turvey B. Evidence dynamics: Locard's exchange principle & crime reconstruction. *Journal of Behavioral Profiling* 2000;1(1):1-15.
2. Taylor D., Buckleton J. Do low template DNA profiles have useful quantitative data? *Forensic Science International: Genetics* 2015;16:13-16.
3. Okubara P.A., Schroeder K.L., Li, C., Schumacher, R.T., Lawrence N.P. Improved extraction of Rhizoctonia and Pythium DNA from wheat roots and soil samples using pressure cycling technology. *Canadian Journal of Plant Pathology* 2007;29(3):304-310.

Background Touch DNA, Pressure Cycling Technology, Low Copy DNA