



B3 Tertiary Transfer of DNA by Examination Gloves Between Evidentiary Items at Crime Scenes

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After attending this presentation, attendees will better understand the potential for tertiary transfer of DNA among evidentiary items at a crime scene via examination gloves.

This presentation will impact the forensic science community by demonstrating potential routes for the cross-contamination of items collected during the course of processing a crime scene.

The increasingly high value placed upon DNA evidence has catalyzed the optimization of more sensitive equipment and chemistries utilized in the detection and analysis of DNA. While these advancements allow smaller quantities of DNA obtained from evidentiary items to be analyzed, they also increase the risk of detecting extraneous DNA that may not be associated with the criminal act. The process of collecting evidentiary items at the crime scene is one potential route of contamination. Protocols for evidence collection in the field, including how frequently gloves should be changed while processing a crime scene, vary among crime laboratories and personnel. The potential exists for the technician to transfer DNA among the items being collected at the crime scene via their examination gloves if not frequently changed.

The main learning objective of this pilot study is to investigate the possibility of transferring DNA among evidentiary items and to evaluate whether or not the amount of transferred DNA that is detected could complicate subsequent genetic analyses and interpretations. It is hypothesized that: (1) examination gloves can act as a vector for the transfer of DNA from one item to another; (2) the quantity of DNA transferred among items will decrease with each subsequent handling; and, (3) the quantity of DNA detected on each item will be at a level that is great enough to compromise the interpretation of DNA typing results.

A sterile plastic cup was handled by ungloved hands. A gloved laboratory technician handled this item (Tier 1) to swab for subsequent DNA analysis. The laboratory technician then handled a second sterile and untouched cup (Tier 2) without changing gloves, followed by a third cup (Tier 3). These items were also swabbed to detect any DNA that might have been transferred to the various cups during the handling process. This procedure was repeated a total of seven times with the laboratory technician changing gloves in between each trial. DNA extraction was conducted using the QIAGEN® QIAamp® DNA Mini Kit. The Quantifiler® Human DNA Quantification Kit in conjunction with an Applied Biosystems® 7500 Real-Time Polymerase Chain Reaction (PCR) instrument was used to estimate the quantity of human DNA present in each sample. Amplification was performed by PCR on an Applied Biosystems® 9700 thermal cycler. Amplified product was analyzed using capillary electrophoresis on an Applied Biosystems® 3130xl (16 capillary) instrument in conjunction with GeneMapper® ID (version 3.2.1).

Primary transfer DNA was detected on all Tier 1 cups, demonstrating the ease of transfer of DNA from an individual to an object. DNA was transferred to the technician's examination gloves and to the Tier 2 cups in 67% of the trials. A partial profile was obtained from one Tier 3 cup, which had the potential to interfere with interpretation. These results demonstrate the vulnerability of evidentiary items to cross-contaminate if examination gloves are not frequently changed at the crime scene. Therefore, the first hypothesis cannot be rejected. The second hypothesis cannot be rejected because the quantity of DNA detected on the items decreased as the laboratory technician handled the Tier 2 and Tier 3 items. Finally, the third hypothesis cannot be rejected since the alleles detected on the Tier 2 and Tier 3 items would interfere with the interpretation of the DNA profile results.

The results of this experiment demonstrate that although tertiary transfer did not occur in every trial, there is the potential for the cross-contamination of evidentiary items via examination gloves. The potential for tertiary transfer in the field should warrant caution during the handling of evidence due to the possibility of transferring an individual's DNA to an item not actually touched by that person. Crime laboratories and personnel should implement procedures to negate this possible route of contamination.

DNA, Tertiary Transfer, Examination Gloves