## B110 Optimizing an Integrated Workflow for Processing Paper Evidence in a Multidiscipline Crime Laboratory

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**Learning Overview:** After attending this presentation, attendees will better understand an optimized multidisciplinary workflow for processing paper evidence for DNA, questioned documents, and latent print analyses. This workflow can be applied to crime laboratories that encounter paper evidence and must share evidence among disciplines.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by providing an evaluation of workflow options in processing paper evidence for DNA analysis while maintaining the integrity of the evidence for other disciplines to process. This presentation will offer suggestions for non-destructive sampling of paper evidence for DNA analysis prior to transfer of evidence to another discipline for further analysis.

Paper evidence is encountered in crimes such as robberies, kidnapping, forged checks, forged prescriptions, and harassment. Traditional methods for processing paper for touch DNA, including cutting pieces of paper and wet/dry swabbing of paper, are destructive to the evidence. Such sampling for DNA analysis may decrease the evidentiary value of the paper for other disciplines (for example, questioned documents and latent prints). Due to the difficulties of processing paper for touch DNA, the flow of the evidence upon submission to the laboratory may start with the questioned documents discipline, then transfer to the latent prints discipline, skipping the DNA discipline altogether. An alternative workflow may involve collecting DNA samples from the paper evidence after it has been processed by the other disciplines. Submitting paper evidence for latent print processing and questioned document analysis prior to DNA analysis may compromise the ability to perform DNA analysis. Both latent print chemical development and questioned document examination may introduce extraneous DNA on the evidence, if clean technique is not used during the processing. As such, the evidence would be rendered unsuitable for DNA analysis after other laboratory sections have completed their testing. An optimized workflow for processing of paper evidence is needed to address the difficulties that may arise in sharing paper evidence among the DNA, questioned documents, and latent print disciplines.

A series of small-scale studies were completed to determine optimal paper sampling for touch DNA, extraction method, latent print chemical development method, and workflow for paper evidence to be shared among the DNA, questioned documents, and latent print disciplines within the laboratory. Evaluation of the data from the small-scale studies and the literature guided the decisions for how the evidence would flow among the three disciplines. A proposed workflow was developed that started with DNA sampling and analysis followed by questioned document examination. Latent print examination was last.

A study of mock evidence using the proposed workflow was conducted by collecting handwritten samples from 12 volunteers. Two paper types, 20lb copy paper and 16lb notebook paper, were tested. DNA samples were collected by dry vacuum swabbing the paper.[1] After swabbing, papers were photographed to document visible markings on the paper, then processed for indented handwriting using the Electrostatic Detection Apparatus (ESDA). After ESDA, papers were returned to their original containers and transferred to the latent print unit for chemical development and evaluation by a latent print examiner. DNA was detected for all samples at quantitation and samples were amplified with the Applied Biosystems® GlobalFiler® PCR Amplification Kit. Profiles were obtained for all samples collected and varied in quality. Profile quality corresponded with quantitation value obtained—the lower the quantitation value, the lower quality of the profile in terms of number of loci with allelic drop-out or peaks below the stochastic threshold. The vacuum swabbing method did not impact the ESDA development of the indented writing for each paper sample. Latent prints of value for comparison were developed for 22 of 24 samples. The results of the testing of the proposed workflow on the mock evidence demonstrate that paper evidence can be shared among DNA, questioned document, and latent print disciplines without loss of evidentiary information. The study gives multidiscipline crime laboratories a framework of how paper evidence should flow through the laboratory once it has been submitted for analysis.

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**Reference(s):**

1. McLaughlin P., Prinz M. Improved DNA recovery from handwritten documents. B114. *Proceedings of the American Academy of Forensic Sciences*, 71st Annual Scientific Meeting, Baltimore, MD. 2019. P318.

**Paper Evidence, Touch DNA, Workflow**



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