D4 Studying the Effects of Plastic Storage Systems on DNA Degradation of Blood Evidence

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After attending this presentation, attendees will have a greater understanding of the effects of storing blood evidence in plastic containers as opposed to the conventional paper bags.

This presentation will impact the forensic science community by serving as enlightenment to alternative storage methods for blood evidence that is collected from a crime scene. The goal is to avoid evidence contamination by increasing organization abilities and reduce the effects of damp storage conditions or flooding.

This research challenges the conventional wisdom that blood evidence should only be stored in paper bags. By expanding the knowledge of the effects of various storage systems on the rate of DNA degradation from blood evidence collected from a crime scene, it will be possible to create alternative storage opportunities for evidence, especially for archival purposes. This has been of concern because evidence stored in paper bags and cardboard boxes have been susceptible to extreme condition changes such as an evidence storage locker flooding or being stored in a freezer. The same properties that allow for moisture to escape, also allow moisture to enter and contaminate the evidence. However, plastic containers are known for trapping moisture as well as repelling it. By learning more about the degradation of evidence stored in plastic containers, future catastrophes could be avoided by storing blood evidence in airtight and waterproof plastic containers. The hypothesis being tested is that if blood evidence is allowed to dry before being stored, there will be lower or equal degradation rates observed in samples stored in plastic containers compared to those stored in conventional paper bags. Moreover, if plastic containers can be employed as a storage system, it would provide for better organization and cataloguing of evidence that could minimize the unnecessary handling of evidence and possible contamination.

The hypothesis is tested by establishing various experimental conditions that are prepared in triplicate and vary in the type of container used and the interval of time that the evidence is stored. Samples are prepared from fresh blood used to stain swatches of t-shirt material in order to replicate actual evidence collection conditions. The controls consist of closed and open paper bags, which respectively represent the current method of evidence collection and evidence that is not stored, but isolated. The time variables being employed were 1 day, 1 week, 2 weeks, 1 month, 2 months, and 3 months. Varying types of commercially available plastic bags and containers as well as plastic evidence bags are used for the container variables. The samples are collected and stored for their assigned lengths of time before organic DNA extractions are performed on the samples. In order to measure the results in a quantitative manner, DNA degradation is measured through the allelic dropout rate observed after amplification using Promega's Powerplex® 16, a NIST approved set of human STR primers. Allelic dropout can be related to DNA degradation because as DNA degrades, it will break randomly throughout the strand, occasionally causing breaks in a sequence that is supposed to be amplified. This occurs first in the longer strands and progressively into the smaller strands as the DNA becomes more degraded. Thus, allelic dropout will begin in the longer sequences and can be measured as it becomes more prominent throughout the DNA profile. This allows for the quantification of the number of samples affected and the degree of degradation observed thus the rate of allelic dropout will be used to test the hypothesis to a 95% statistically significant level.

Plastic, Storage, Blood

 ** Presenting Author*