Y15 The Effects of the Evidence Preservation System (EPS) on the Storage of DNA Samples

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Learning Overview: After attending this presentation, attendees will be informed about the investigation into the usage of the EPS as a potential viable storage unit in comparison to common laboratory storage practices.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by testing a new technology in sample storage that could be utilized in most laboratory settings. This new technology could potentially prove to be the ideal storage environment to help improve and maintain the quality and quantity of DNA.

This research hypothesizes that the EPS unit will have higher quality and quantity DNA samples compared to room temperature, with similar results to 4ºC and -20ºC storage environments.

Storage of collected samples is a concern for all disciplines of forensic science. Without proper storage, especially DNA samples, the DNA will become unusable as it could become degraded, cross contaminated with other samples, etc. Much of the preliminary research revealed that there were very few studies on the storage of forensic samples regarding ideal protocols, let alone those that involved combining many controlled storage aspects, such as temperature, humidity, and Ultraviolet (UV) exposure. This research focuses on the EPS by Forensic Solutions, Inc., which is a controlled environment able to be programmed to control temperature and humidity while also preventing UV radiation exposure and bacterial growth on samples.

The purpose of this research was to perform comparative studies between normal laboratory storage conditions of -20ºC, 4ºC, and room temperature environments, and the EPS unit storage by examining their effects on the quantity and quality of degraded DNA samples as well as the drying weight of samples. For the drying weight comparisons, T-shirts were obtained with no specific material preference and were washed to mimic actual use by an individual rather than ideal conditions. One hundred forty-four 2"x2" swatches were then cut from one shirt and weighed before having blood deposited on them. One hundred twenty samples received a blood deposit of 50µL while 24 swatches were left unaltered for negative controls and 24 0.5mL tubes were filled with 50µL of blood to serve as the positive controls. Once dried, these samples were re-weighed, then placed and sealed inside labeled coin packages. These packages were separated into groups of 42 for each of the four environments (30 samples, 6 positive controls, 6 negative controls) and stored in their respective environments for a six-month period.

For the degraded sample comparisons, preliminary testing was done to determine the medium the blood was to be deposited on and the amount of blood that was to be deposited. It was decided that clothing swatches with 50µL of blood would be an adequate medium for this experiment. One hundred sixty-eight 2"x2" clothing swatches were cut from another washed shirt. One hundred forty-four of these samples received a 50µL deposit of blood while the remaining 24 were left unaltered to serve as negative controls. Once dried, 120 of the swatches were then exposed to UV radiation for ten minutes to irradiate the non-deposit side of the swatch for degradation. The samples were then placed and sealed in labeled coin packages. These packages were separated into groups of 42 for each of the four environments (30 samples, 6 positive controls, 6 negative controls) and stored in their respective environments for a six-month period.

Every month, five samples, one positive control, and one negative control were removed from each storage environment from both the degradation study and the drying weight study experiment groups. The degradation samples would undergo extraction, quantitation, amplification, and detection to determine any changes in quality and quantity of the DNA between storage environments. The drying weight samples would have their weights recorded and compared for any weight changes between the storage environments. Due to the importance of the storage of forensic samples across all disciplines, the EPS unit could a very useful resource that could change and potentially improve the way various forensic samples are stored.

Evidence Preservation System, Forensic Sample Storage, DNA Degradation

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