H41 An Assessment of DNA Degeneration Due to Air-Drying Preservation for the Remains of the World Trade Center

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The goal of this presentation is to detail the results of genetic tests performed on the human remains from the World Trade Center from before and after preservation through air-drying. These results help to assess the drying process as a viable option for preservation in future mass fatality incidents. The details of the drying process itself were presented in a paper at the 2003 meetings in Dallas, TX.

This presentation will impact the forensic community and/or humanity by presenting an assessment of possible DNA degradation due to a preservation process that has not been used previously in a forensic context before. This information will allow forensic professionals to judge the viability of air-drying as an option for the preservation of human remains from future mass disasters.

This paper will present a statistical analysis of DNA tests performed on the human remains from the World Trade Center before and after their preservation through air-drying. The results of this statistical analysis illustrate the effect the air-drying preservation method has on the genetic material held within the remains.

The remains recovered from the World Trade Center site in the months following September 11th, 2001 were preserved using a method of air-drying. The air-drying method was utilized as an attempt to preserve the remains without significantly degrading the genetic material contained within, allowing for future DNA testing if warranted.

To assess the impact of the drying process on the genetic material in the remains, two different experiment designs were used. For the first experiment, soft tissue samples were extracted from a random sample of the remains during their preparation for the drying process. A second sample was extracted from the remains after the drying process was completed.

The second experiment was designed to control for sample location, length of time spent drying, and size of sample. In this test, strips of muscle of approximately 50ml were taken from 30 sets of remains. Each sample strip was divided in half; with one half sent directly for DNA testing. The second half of each sample was subjected to the drying process, then, upon completion, sent for DNA analysis.

All tissue samples were taken following a strict sampling process. Samples were taken from portions of remains featuring large muscle groups enclosed under unbroken skin to ensure both ample size and no contamination. New, sterile disposable scalpels were used for each sample. At least one scalpel was used to make the initial incision through the outer skin layers, while another was used to cut out the tissue to be taken. The muscle strips were extracted using reusable forceps thoroughly cleaned with 10% bleach water.

The samples were tested using both DNA IQ and Organic DNA techniques, with the results ranging from 0 - 16 loci. For both experiments, a paired samples *t* test was performed using the corresponding pre-dried and dried variables. The *t* tests will show if there is a significant increase or decrease in the average number of loci recovered from the dried samples when compared to the pre-dried samples.

Statistical analysis of the test results from both experiments shows that a significant decrease in loci yields did occur between the pre-dried and dried samples. After a number of other possible factors were ruled out, it was concluded that the drying process itself was the cause of the decrease in loci through the combination of temperature shock, the high temperature itself, and the already fragile state of the DNA. However, while the experiments showed that the drying process did significantly degrade the DNA of the remains, they also show it was still possible to retrieve DNA. The DNA was not completely degraded in every sample, as other preservation options would have done.

Because the remains were preserved and DNA can still be retrieved, drying may be a viable option for preservation in the future should the needs of a particular disaster warrant its use and available resources allow for it. In addition, until now, research on DNA stability in a forensic context has been limited to the effects of various environmental factors occurring in common situations and do not reflect those that occur at the extremes. Information may be drawn from this research regarding the stability of DNA in extremes of both high temperature and low humidity.

Mass Disasters, Preservation, DNA Degradation

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