A19 DNA Degradation in Simulated Arson Cases Using Various Accelerants

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After attending this presentation, attendees will learn the results of systematic experiments using three accelerants, including methyl ethyl ketone, gasoline, and a mixture of lighter fluid, gasoline, and diesel fuel, on the quality and quantity of DNA recovered as assayed using UV-Vis spectroscopy and agarose gel electrophoresis from controlled burns using pig muscle to simulate a potential cases resulting from an accidental fire, arson fire or a mass disaster event. In particular, each one of these three accelerants exhibit different burn rates and temperatures and affect the quality and quantity of DNA recovered after various time intervals.

This presentation will impact the forensic community by providing systematic data that can be used in evaluating cases of accidental fire, arson, and mass disaster. Both agarose gel electrophoresis and UV-Vis spectroscopy methods allow an investigator to determine the presence and quality of DNA samples recovered from the crime scene using rapid and non-destructive techniques. The determination of which samples provide quality DNA in comparison to those that yield no detectable DNA may help the investigator to decide which samples to collect and package for further DNA processing and which are less likely to produce results.

The use of DNA to identify human remains after an accidental fire, arson fire or even a mass disaster has become a cornerstone in the forensic community. This presentation involves the use of three prevalent accelerants that cause a fire to proceed at a much faster rate and at a higher temperature and how the use of each one can have a unique effect on tissue and bone. When dealing with arson victims and the need to identify burned remains, it has not been confirmed when autosomal and mitochondrial DNA extraction should be used. There is a definitive window of time, dependent upon the accelerant used and length of time of burn, when autosomal STR analysis of DNA can be used to identify a burn victim. This research sought to answer how much time it takes to burn a piece of flesh to the point that DNA cannot be extracted used for identification purposes based on quality and quantity, if the accelerant itself causes degradation to the DNA when it is applied to the flesh prior to the burn, and if any initial degradation causes the appearance of heightened burn degradation in order to determine the window of time available and to suggest a protocol to analyze the DNA available.

The research described in this presentation includes both the detailed systematic methods constructed in this study and answers to the questions posed by concluding the results of each controlled burn including both agarose gel (0.8%) electrophoresis and UV-Vis spectroscopy (260/280 nm ratio) results. Standard DNA extraction were used techniques (phenol/chloroform) using pig muscle as purchased from the supermarket. In order to determine the effect of accelerants on DNA, one large rack of pork ribs was divided evenly and each piece was analyzed individually using an equal proportion of accelerant by mass. The accelerants used were methyl ethyl ketone, gasoline, and a mixture of lighter fluid, gasoline, and diesel fuel. Control samples of unburned and unexposed pig were also assayed. A known amount of accelerant was applied to each piece being analyzed and a second sample was taken to determine whether degradation had already started to take place. A controlled burn was done in the laboratory and three pieces of pig were burned for various times with each accelerant. Additional samples of DNA were taken from different areas of each piece and analyzed to confirm the initial results.

Arson, DNA, Accelerants

 ** Presenting Author*