D41 Detection of Gasoline From Lung Tissue and Heart Blood for Use in Determining Victim Status at the Time of a Fire

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The goal of this presentation is to understand how gasoline can be detected from the lungs and heart blood of a deceased victim post fire for use in determining the victim's status at the time of the fire.

This presentation will impact the forensic science community by demonstrating the importance of analyzing a victim's tissues for ignitable liquid residues post fire as it can allow for the determination of a the victim's status.

In Ontario, fire investigators from the Office of the Fire Marshal (OFM) are responsible for determining the origin and cause of fires and explosions within the province and in particular those of suspicious nature. As part of the fire investigation, debris samples are collected from the scene and analyzed by the Center of Forensic Sciences. The standard practice is to collect items that are porous, highly absorbent, or adsorbent with high surface areas as they allow for better retention of the ignitable liquids. The items collected most often are carpets, cardboards, soils, cloths, and other items that have not been impinged by flame such as material under baseboards. These samples are analyzed for the presence of any ignitable liquid residues which may be evidence of an accelerant used in the fire. This information will aid in determining if the fire was intentionally set.

The purpose of this study was to determine the feasibility of identifying whether a victim was alive or deceased at the time of a fire started with accelerants by detecting gasoline residues within their lungs and heart blood post-fire. It was hypothesized that only when a victim was alive and performing respiration would sufficient gasoline for detection be present in the lungs and heart blood post-fire. This experiment involved anesthetizing a live pig, exposing the pig to gasoline vapors for 10 minutes, and then euthanizing it. The carcass was clothed with a cotton t-shirt and placed in a house where additional gasoline was poured onto it and the house set ablaze. The house also contained two pig carcasses, one with gasoline poured directly onto it (positive control) and the other with no gasoline exposure (negative control). Thermocouples were placed under each carcass and in the center of each room at ceiling and floor levels to measure the temperature. After the fire had reached flashover and was suppressed, the carcasses were collected and their lungs and heart blood excised at a necropsy. The lungs and heart blood were then placed into glass jars as per OFM protocol. The headspace from the samples was analyzed by thermal desorption-gas chromatography-mass spectroscopy for the presence of a gasoline signature.

Preliminary results showed that only the lungs and heart blood from the live pig that inhaled gasoline contained gasoline residues. This indicates that it is possible to determine a victim's status at the time of the fire based on the detection of gasoline in the lungs and/or heart blood. The thermal data showed that the bodies act as an insulator and protects the underside, as the temperatures under the carcasses did not exceed 30□C while the room was over 900□C. This protective feature of the body was also demonstrated when portions of the t-shirt were found intact underneath the carcasses after the fire. To validate these findings an additional three house fires and four vehicle fires will be conducted.

Fire, Accelerants, Chemistry

 ** Presenting Author*