



W11 Some Like It Hot: A Forensic Analysis of Burnt Remains

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After attending this presentation, attendees will: (1) be introduced to fire scene investigation involving burnt human remains and their recovery; (2) recognize the micro- and macroscopical changes undergone by the body, skeletal, and dental hard tissues when subjected to fire; (3) understand the different techniques, approaches, and challenges for the identification of burnt human remains, including the practical issues; (4) learn what additional information about the incineration event can be gained through burnt bone analysis; and, (5) gain insights through the discussion of forensic casework.

This presentation will impact the forensic science community through the presentation of multidisciplinary and innovative approaches to tackle complex cases of burnt human remains with a more holistic approach to not only facilitate the identification of remains, but to also glean insight into the reconstruction of the incineration conditions.

Mass disasters, aircraft accidents, or motor vehicle collisions can involve fire; sometimes, a fire may have been set to destroy forensic evidence, including to prevent the identification of the deceased. When the fire affects a large area, it often cannot be extinguished for many hours or even days. As a consequence, some bodies are subjected to prolonged high temperatures and, in many cases, be reduced to extremely fragile skeletal elements. Thus, the identification of human remains subjected to incineration depends on the degree of destruction of the remains, which is affected by the intensity and duration of the fire. In fact, the loss of soft tissues destroys visual and fingerprint clues, leaving odontology, anthropology, and DNA as the only possible identifiers.

Subsequent to the destruction of skin and soft tissues, the skeletal remains exposed to fire or high temperatures undergo changes both on a macro- as well as a microscopical level. Macroscopically, high-temperature exposure modifies the bone structure in size, color, and shape. At the microscopic level, there are different changes in chemical and crystalline structures. All of these changes complicate the estimation of sex, age, and stature, challenging the accurate identification of the remains. The same changes are found in teeth. Although genetic identification can be an option in some circumstances, DNA extraction, yield, and quality is also affected by the intensity and duration of the fire.

Therefore, due to the fragility of skeletal and dental remains, the maximization of collection and stabilization are required at the very early stages of scene recovery; attention to detail and care throughout the analyses to maximize the extractable information is critical.

Based on these issues and challenges, a multidisciplinary team effort of forensic pathologists, anthropologists, odontologists, and analytical scientists is essential to facilitate the correct identification of the victims and to reconstruct the incineration conditions.

This workshop will illustrate this multidisciplinary effort, explaining the recovery of burnt human remains from the fire scene and the analysis of these remains at different levels — macroscopic, microscopic/biochemical, and genetic — to facilitate the identification of the victims, applying anthropological, odontological, and genetic techniques to finally illustrate the discussed approach and challenges through practical case studies.

Fire Scene, Burnt Remains, Forensic Identification