A44 Burning Models: Human vs. Pig in Taphonomic Fatal Fire Modeling

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The goal of this presentation is to understand the fundamental differences between how the human body burns and how a pig burns which are two different processes and have two distinct outcomes. Results from 12 bodies (n=6 pigs and 6 humans) that were burned under similarly replicated conditions with direct and radiant heat produced early-to-advanced heat-related changes to the respective human or pig body. Pig tissues differ from human tissues in their thickness, configuration, and organization.

This presentation will impact the forensic science community by answering the question, "Is it reasonable to model burn patterns on tissues that are not of human origin, such as the pig, in fatal fire modeling?" This research will demonstrate that no, the pig is not an acceptable model to use in fatal fire modeling for a number of reasons that include their comparative soft tissues of skin, muscle, and fat, and the differences of the musculoskeletal systems.

Forensic taphonomic modeling has been peppered with the use of porcine models, since they are said to be, "the most similar to the size, shape, and anatomy of the human torso." In fact, the pig model has become the standard species used to replicate a wide variety of decompositional studies, along with other similar-sized animals such as deer or sheep. Anatomy of the thoracic cavity and abdomen of pigs may be similar to humans, but when it comes to areas of the head and the limbs; the parallels cease to exist. Likewise, the soft tissues themselves respond differently in the porcine model than what occurs in the human tissues of the skin, the underlying subcutaneous fat, muscles, tendons, and, ultimately, the bones. To fairly test the differences between the two species, a total of six young (100+lb) pigs and six adult unembalmed human bodies were burned together within the same fire environments on three separate occasions to discern similarities and differences of the burn patterns and to answer the question, "Is it a good idea to use pigs/quadrupeds for fire modeling in taphonomic research when drawing human comparisons in fatal fire modeling of forensic casework?"

Pig skin is much thicker than human skin. Human skin is thin and elastic and is the first boundary to heat exposure; it therefore exhibits the earliest heat-related changes of the body. Human skin splits several minutes into the fire, while the thicker pig skin takes longer to split (>ten minutes). The biggest difference between the two is the fact that humans have a healthy layer of subcutaneous fat underneath the skin, whereas young pigs are solid muscle under their skin and lack this important layer of soft tissue. This difference is the one of the major flaws with using pigs to model humans in fatal fire modeling. The human body's thin elastic skin and abundant underlying subcutaneous fat plays a huge role in the burn patterns that are unique to the human body as well as the burning process as time passes during the fire. Another major difference in this study was that the pig bone was young and had immature developing bone with the epiphyses and young joint structures. When the smaller limbs of pigs flexed, the entire joint surface became exposed along with the epiphyses and diaphyses of the pig knuckles. Flexion of the limbs was a major difference between pigs and humans as short quadrupedal anatomy cannot replicate the lengthier human form, particularly of the upper body. Likewise, the musculoskeletal anatomy of the human and pig head does not warrant comparison due to differential buttressing of the pig's face and skull that differs from that of the human's unique craniofacial complex. These are several reasons to discourage the use of pigs as human models when it comes to fatal fire modeling where literal comparisons may be based off of the burn patterns.

Fatal Fire Modeling, Burn Patterns, Pig or Human