H98 The Analysis of Insect Succession Rate and Pattern of Decomposition in Charred, Clothed Remains

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After attending this presentation, attendees will gain an understanding of the effects of accelerants on the rate and pattern of decomposition.

This presentation will impact the forensic science community by providing important information regarding Postmortem Interval (PMI) estimations for forensic investigations and a broader understanding of factors that affect decomposition.

Clandestine fires are common in criminal settings where fire is used to destroy evidence which may link the perpetrator to the crime or to obscure the victim's identity.[1] The offender may cover the body in accelerant before ignition, while underestimating the amount of fuel and heat required, thus producing only partially charred remains.[2,3] Offenders use easily accessible accelerants, with petrol employed in most cases (50.4%) and paraffin in fewer (28%).[4] Due to the nature of clandestine fires, the victim's body is often not recovered immediately; therefore, the PMI estimation becomes forensically relevant because it allows an approximation of the date of the incident and may aid the identification process.

There is a paucity of literature regarding the decomposition of charred remains and techniques for the approximation of the PMI. Given the awareness that fire is employed in homicides to destroy human remains and the frequency of lengthy delay in discovery, the presence of this gap in the literature is surprising. Gruenthal *et al*. (2012) represent the single attempt in PMI approximations in remains charred to Crow-Glassman System (CGS) Levels 1 and 2.[5] This research provides an approach to the estimation of the PMI in accelerant-charred remains and aims to determine whether or not the use of these accelerants in burning the remains had a significant effect on insect succession (Coleoptera and Diptera), pattern, and rate of decomposition.

At the beginning of the experiment, 30 domestic pig carcasses (*Sus scrofa*) were transported to the Taphonomic Research in Anthropology Centre for Experimental Studies (TRACES), University of Central Lancashire. The pigs were separated into three groups and were washed and weighed, and thermocouples with data loggers were inserted rectally before dressing the pigs in T-shirts and shorts. The pigs were then placed in their field locations five meters apart, and treatment carcasses were covered with 2.5 liters of their respective accelerant before ignition, within minutes of application. The fires burned out naturally, and the extent of thermal destruction was scored using the Crow-Glassmann System (1996).[5] Each pig was covered in a wire mesh cage to prevent vertebrate scavengers from accessing the carcasses.

Data collection intervals were approximately every 30 – 40 Accumulated Degree Days (ADD). During each data collection, the treatment carcasses were scored using both the Gruenthal et al. (2012) and the Megyesi et al. (2005) scoring systems while the control carcasses were scored using only Megyesi et al. (2005)[6,7]. Data loggers were used to record ambient and internal temperatures (°C) at 6-hr intervals.

Data analyses were carried out using statistical software, R (V 2.9.3). A comparison of the two scoring systems for the accelerant-charred remains was carried out using a mixed effects model, and indicated both scoring systems can be applied with equal success for decomposition in accelerant-charred remains (r^2=0.89).[6,7] Rate of decomposition was analyzed using linear regression Analysis of Covariance (ANCOVA) with Total Body Score (TBS) as the response variable, and treatment and ADD as explanatory variables.

After 540 ADD, results showed the control group decomposed significantly faster than the burned groups ($p \leq 0.001$), while petrol decomposed significantly faster than the paraffin ($p \leq 0.001$).

Pattern of decomposition was scored separately for each of the three regions. The head and neck region was significantly different between the control and the two experimental groups ($p \leq 0.001$); there were no significant differences among any of the groups in the torso and limb regions.

The preliminary results suggest both scoring systems can be used for assessment of accelerant-charred carcasses. Accelerant-burned bodies decomposed significantly more slowly than unburned bodies. In particular, the head region of the treatment groups decomposed significantly more slowly than that of the controls. It is hypothesized that the presence of accelerants masks the volatile odors produced during early decomposition, thus delaying blowfly oviposition, and postponing the consumption of the carcass by maggots.

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Burning, Accelerants, Decomposition

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