



### H93 The Influence of the Topical Application of Cosmetic Products on the Rate of Decomposition and Insect Activity on Pig Carcasses

Sophie Radicke\*, and Tal Simmons, PhD, School of Forensic and Investigative Sciences, University of Central Lancashire, Preston, PR1 2HE, UNITED KINGDOM

The goal of this presentation is to provide attendees with information about the effects of the topical application of three commonly used cosmetic products on the rate of decomposition and insect activity on the carcass and how this might affect the estimation of the postmortem interval.

This presentation will impact the forensic science community by suggesting that the rate of decomposition and insect activity on a corpse is not affected by the application of cosmetic products. As a result the potential presence of cosmetic products on a dead body does not have to be taken into account estimating the postmortem interval.

The total body score (TBS) appearance of decomposition of a cadaver can be helpful to determine the time-since-death. The TBS is a combination of point scores, which are derived from the individual assessment of the decomposition stage of head and neck, trunk and limbs (Megyesi *et al.*).<sup>1</sup> The characteristics of decomposition appear a more or less fixed sequence; however, the rate at which these appear is highly variable. A number of factors have been shown to influence the rate of decomposition. One of the most influential factors is insect access to the cadaver (Simmons *et al.*).<sup>2</sup> Circumstances restricting insect access and activity on a corpse may include its placement, whether it has been wrapped or covered and whether insect repellent substances are present on the body.

Charabidze *et al.* found that the application of HCl, patchouli perfume, insecticide and petrol significantly delayed the arrival of flies to rat carcasses in comparison to the control group.<sup>3</sup> Under laboratory conditions it was also observed that mosquito citronella repellent, HCl, insecticide, petrol and paradichlorbenzene have a repellent effect on female flies (Charabidze *et al.*).<sup>3</sup> A similar insect-repellent effect of insecticides has been noted by Vass, which also led to initial underestimation of the postmortem interval.<sup>4</sup> The previously mentioned research shows that the application of varying substances have an effect on insect activity on the carcass and as a result may influence the rate of decomposition and thus also the estimation of time-since-death.

However, no literature exists that considers the effect of commonly used substances that are applied to a large portion of the body such as cosmetic products. Considering the widespread use of these products, it is important to establish any potential effects on the rate and/or pattern of decomposition that could lead to a miscalculation of time-since-death.

As a model for human cadavers, carcasses of the domestic pig (*Sus scrofa*) were used in this research. Three experimental groups and one control group were set. Each group consisted of four carcasses that were laid out on the ground. In each of the experimental groups, either sunscreen, fake tan or insect repellent was applied to the animal's body surface. The area covered included the head, trunk and limbs, but excluded the anal and groin area. This was done to represent a realistic application pattern as closely as possible.

The stage and pattern of decomposition was assessed using Megyesi *et al.*'s scoring system and carcasses were observed approximately every 50 Accumulated Degree Days (ADD).<sup>1</sup> Insect activity was measured by the body surface area covered with superficially visible maggot masses, which was converted into a maggot mass score (MMS). The MMS increased with the amount of the body surface area being covered. Furthermore, samples of maggots were taken from the maggot masses and reared to the adult stage to determine the insect species attracted to the carcasses.

The experiment ran for a total of 694 ADD during which the rate of decomposition was consistently similar in all four test groups and did not show any significant differences (Mixed effects model, DF = 3, F = 0.556, *p-value* = 0.654). Superficial maggot masses were first noted in all groups at 141 ADD. As a general trend, the MMS increased until 376 ADD and then dropped again in all groups. The increase in the MMS was, however, not linear and fluctuated until reaching its highest value. At the end of the experiment no superficial maggot masses were observed in most carcasses.

Identification of collected and reared larvae showed the most abundant fly species in all groups was *Calliphora vomitoria*, followed by *Protophormia terraenovae* and *Calliphora vicina*. In contrast, *Lucilia sp.* were observed less frequently.

The results of this study indicate that the topical application of cosmetic products to a large portion of the body surface area does not have any notable effects on the rate of decomposition; neither did insect activity, as measured by the size of superficial maggot masses, differ between the control and test groups. As insect activity has a key influence on the rate of decomposition, these two findings are concordant and consistent with previous research. In conclusion, applied cosmetic products cannot be considered to be a factor that needs to be taken into account when determining the time-since-death.

#### References:

1. Megyesi MS, Nawrocki SP, Haskell NH. Using accumulated degree-days to estimate the postmortem interval from decomposed human remains. *J Forensic Sci* 2005;50(3):618-26.
2. Simmons T, Adlam RE, Moffat C. Debugging decomposition data – comparative taphonomic studies and the influence of insects and carcass size on decomposition rate. *J Forensic Sci* 2010;55(1):8-13.



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- <sup>3</sup>. Charabidze D, Bourel B, Hedouin V, Gosset D. Repellent effect of some household products on fly attraction to cadavers. *Forensic Sci Int* 2009;189:28-33.
- <sup>4</sup>. Vass AA. Beyond the grave – understanding human decomposition. *Microbiology Today* 2001;28:190-2.

**Decomposition Rate, Cosmetic Products, Entomology**