B130 The Effects of Varying Decomposition Settings on Powder Stippling Patterns on Skin

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After attending this presentation, attendees will better understand the persistence of Gunshot Residue (GSR) patterns over time under varying decomposition variables and be aware of methods to best identify GSR on decomposed skin.

This presentation will impact the forensic science community by illustrating the effect of decomposition on GSR patterns and indicating optimal methods to identify such patterns when visual identification is no longer possible. The chemical methods discussed in this presentation, adapted from traditional form, may assist investigators in the field in identifying firearm evidence on decomposed bodies.

The purpose of this study was to examine the effect of varying decomposition exposure settings on GSR powder patterns, particularly powder stippling patterns, on skin using animals as a model for human skin. The GSR patterns were examined using photography, stereo-light microscopy, and chemical methods.

GSR is of particular forensic importance in firearm-related incidents as it can be used in forensic reconstruction in regard to distinguishing range-of-fire since GSR patterns are defining features of an intermediate range-of-fire.[1] Powder stippling is a specific type of GSR pattern that results from the impact of unconsumed and partially consumed gunpowder kernels with live skin that leads to small, hemorrhagic injuries in live tissue; however, the preservation and condition of these patterns throughout decomposition are dependent on a variety of factors, as even human activity can impact exposure.[2,3] Some case reports have even indicated attempts to conceal the smell of putrefaction via the application of insect repellant.[4]

In this study, 11 anesthetized bull calves were shot with a handgun at a distance of approximately two inches and immediately euthanized. They were then subjected to decomposition in an open field fully exposed and under three altered decomposition settings: buried, covered in vegetation, and covered in insect repellant. Bull calves were chosen since studies have shown that bovine tissue is similar in structure to human skin and exhibits similar decomposition activities to human cadavers.[5] For comparison, the experiment with bull calves was coupled with a series of trials in which fresh pig skin was shot to create GSR patterns and subjected to decomposition fully exposed. The pig skin GSR patterns and bull calves' powder stippling patterns were photographed throughout all stages of decomposition and examined with a stereo-light microscope. When GSR patterns became difficult to identify visually, the patterns were swabbed and subjected to modified Griess and Sodium Rhodizonate tests to test for chemical components of GSR, including nitrites and lead, respectively. Tissue specimens were collected from select bull calves for histology as an additional method of visualization for the presence of GSR.

It is hypothesized that decomposition will progressively alter the physical appearance of the gunshot lesion and GSR pattern, but that visual identification of the patterns will persist up until the stage of advanced decay. Furthermore, purposeful efforts to limit exposure (burial, vegetative covering, or chemical masking) will increase the persistence of patterns that permit visual identification. Finally, it is hypothesized that chemical analyses and histology may be able to identify the GSR pattern in an advanced state of decomposition. Preliminary results of this study have shown that Sodium Rhodizonate tests are the more sensitive chemical method for identifying the presence of GSR in advanced states of decay. The pig skin trials have illustrated that the visual persistence of GSR is impacted by the firearm and ammunition used. Stereo-light microscopy has also identified the presence of unburnt GSR kernels on skin approximately two months decomposed.

Reference(s):

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