Y2 Persistence of Tool Marks on Bones After Burial

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Learning Overview: After attending this presentation, attendees will have a better understanding of how tool marks persist on bones after burial for varying lengths of time in different substrates and at different depths.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing an increased understanding of the reliability of tool mark data taken from bones found in outdoor environments.

When biological remains, such as bones, are part of a crime scene, it is known that biotic and abiotic factors are immediately at work, affecting the presentation of evidence to crime scene investigators. The impact of various biotic and abiotic factors will change over time with increasing exposure of the remains to these factors. In an attempt to quantify the impact of such factors on the reliability of data collected from remains, this study created a controlled experiment in which soil type, burial depth, and length of burial time was varied. This study obtained 36 fresh bovine bone fragments, each approximately 10cm in length, and coarsely cleaned the flesh from the bones, although there was still a significant amount of flesh present on the bones prior to burial. The bones were stored frozen to halt any biotic action prior to placement in the treatments. The bones were "tool marked" using a standard Dremel® blade to create repeatable mark types, but to varying depths and lengths. The depth of the cuts were treated as a continuous variable and ranged from superficial to ~3mm in depth. Each bone was marked three to six times with varying depths of the mark. From each marked bone, a cast was made using Mikrosil™, and the depths of the marks were measured from the casts using a digital caliper. The bone fragments were divided into four bins (nine bones apiece); two bins were filled with store-bought play sand and two were filled with clay-soil obtained from the local environment. The soil type was quantified using standard soil sieve sets. Bones were buried at three depths, top, middle, and bottom. The bins were kept in an outdoor experimental facility with chain-link fencing on all sides, including the top, and were therefore exposed to naturally occurring biotic and abiotic influences, but vertebrate scavengers were effectively excluded. Bones were retrieved at one week, two weeks, and four weeks, starting with the most shallow bones so as not to disturb bones remaining in the treatments. As each bone was recovered from each bin, they were brushed clean, a Mikrosil™ impression was made of the tool marks, and the dimensions of the tool mark casts were again measured with a digital caliper and recorded.

The resulting data indicated a change in the size of tool marks over time, with superficial tool marks decreasing in size and some deeper tool marks appearing to increase in size, with no clear effect of soil type. Time in the bins and depth of burial seemed to amplify this trend, although additional experiments are needed to tease out the different factors more clearly.

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Tool Marks, Bones, Burial