A65 The Effects of Decomposition Upon the Efficacy of Biometrics for Positive Identification

Kelly Sauerwein, University of Tennessee, Dept of Anthropology, 250 S Stadium Hall, Knoxville, TN 37996; Tiffany B. Saul, MS*, 9919 Thunderbolt Way, Knoxville, TN 37923; Dawnie W. Steadman, PhD, University of Tennessee, Dept of Anthropology, 250 S Stadium Hall, Knoxville, TN 37996; and Chris Boehnen, PhD, Oak Ridge National Laboratory, PO Box 2008 MS-6075, Oak Ridge, TN 37831*

After attending this presentation, attendees will understand: (1) the utility of biometrics for obtaining positive identification of unknown individuals; (2) the effects of decomposition on facial, iris, and fingerprint characteristics; (3) the necessary procedures for successfully obtaining these biometrics from human remains; and, (4) the types of predictions that can be made from these data.

This presentation will impact the forensic science community by describing the advantages and limitations of the use of biometric identifiers at early stages of decomposition.

Biometric identifiers are measurable, unique characteristics that are used to classify both living and deceased individuals. This study examines the effects of decomposition upon the ability to capture biometric information from three physiological characters: facial photographs, fingerprints, and iris scans. This study examines the maximum number of days in which usable biometric data can be successfully collected using digital technologies and how the recognition performance decreases over time. For the purposes of this study, *usable data* refers to images that are able to correctly identify the individual through a digital biometric program by matching the captured images with images taken upon the initial receipt of the donated individual. This study was conducted in conjunction with Oak Ridge National Laboratory and the University of Tennessee Anthropological Research Facility between the months of April and June. Digital facial photographs, iris scans, and fingerprints from the donated remains of eight (n=8) individuals were obtained daily until usable data could no longer be captured. The individuals were placed supine and mostly uncovered with the exception of wire mesh placed over the hands to prevent scavenger activity. The left iris of all individuals was hydrated with 0.4mL of sterile saline solution ten minutes prior to iris scanning to determine if this would increase the quality of images compared to the untreated right iris. No other preparations were made to the remains prior to data collection.

With daily high temperatures ranging between 59°F (15°C) and 84°F (28.89°C) during the spring trial (n=4), usable data was obtained for an average of four days. However, the early summer trial (n=4) included high temperatures between 81°F (27.22°C) and 91°F (32.77°C) and the number of days usable data could be captured was reduced to two. Overall, fingerprints proved to be the most reliable biometric data, producing usable data longer than iris scans or facial images (four days for fingerprints, two for facial, and one day for iris images). Insect activity, bloating, and color changes due to decomposition prohibited the capture of usable facial images after an average of two days (regardless of season), while dehydration, clouding, and collapse of the cornea prevented capture of usable iris scans after an average of two days in the spring and only one in the summer. Additionally, hydration of the left iris did not lead to an improvement in the quality of iris images when compared with the right iris.

This study demonstrated that digitally captured biometric data can be used within two to four days postmortem to identify individuals, compared to existing antemortem biometric data. For some modalities such as iris recognition, it has been generally believed, but never studied, that iris biometrics are only viable within the first 24 hours; however, the results of this study show that they remain viable for a longer period of time, depending upon environmental conditions. When scavenger activity is inhibited, fingerprints persist longer than facial and iris identifiers; however, temperature, precipitation, and insect activity were the primary factors affecting the retention of biometric information in decomposing human remains. While this study is an initial step in determining the utility of physiological biometric identifiers during the decomposition process, biometric research has the potential to make important contributions to forensic anthropology and the law enforcement, military, and medicolegal communities.

Biometrics, Human Decomposition, Positive Identification