B49 The Effect of Body Mass and Cadaveric Bloat on DNA Quantity and Downstream Short Tandem Repeat (STR) Success

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The goal of this presentation is to provide attendees with information regarding the effect of decomposition on the quantity and quality of DNA extracted from the muscle tissue of human cadavers for identification purposes. Attendees will become familiar with how the processes of DNA degradation and damage occurring throughout the early stages of the human decomposition process affect downstream STR typing success.

This presentation will impact the forensic science community by emphasizing the importance of sample collection before a body enters the bloat stage to ensure the highest chance of successful genotyping using STRs for human identification purposes.

Human remains may be recovered for identification during forensic casework, missing persons cases, or after a mass disaster. These bodies may be found in various stages of decomposition, including fresh, early decomposition, bloat, advanced decomposition, and skeletonization. In such cases, DNA profiling using STRs is routinely applied to identify the remains; however, DNA is known to degrade after death, and harsh environmental conditions such as heat, humidity, and exposure to sunlight speed up decomposition and lead to increased DNA damage and degradation. In addition, body mass is also known to affect the rate of decay. This project assessed the amount and integrity of DNA recovered from low (average 53kg) and high (average 84kg) body mass cadavers through the early stages of decomposition and determined the success of STR profiling throughout each stage.

This study investigated the quantity and quality of DNA extracted from the quadriceps muscles of six cadavers during the first 12 days of decomposition where soft tissue persisted. The cadavers were placed in an outdoor environment in either April or October in southeast Texas. DNA from the quadriceps muscle was extracted and assessed to determine DNA quantity and quality via real-time Polymerase Chain Reaction (PCR) (DNA concentration and degradation ratio), and genotyping was performed using a commercial STR amplification kit.

As expected, the quantity and quality of DNA decreased as decomposition progressed, accompanied by a decrease in the number of reportable alleles and peak heights across the STR profiles. Complete STR profiles were obtained from all bodies until day four of decomposition. Although variation between the cadavers was evident, an interesting trend was observed between low and high body mass cadavers. The DNA quantity and STR profile quality decreased rapidly at the onset of bloat (around day six) in the low body mass cadavers, whereas in the high body mass cadavers, a similar decrease occurred several days later (day ten), near the end of the bloat stage. This phenomenon resulted in complete (or near complete) STR profiles being obtained from the larger cadavers for up to four days longer than the smaller bodies. On average, the number of STR alleles recovered from all cadavers decreased during bloat, indicating the importance of collecting tissues for DNA analysis as early as possible from all decomposing bodies, with the bloat stage marking the most rapid decrease in DNA quantity and STR success during the initial stages of decomposition for both high and low body mass cadavers.

Human Decomposition, STR Typing, Human Identification

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