H120 Multiple Sampling of Human Muscle Tissue Over Time to Eliminate Biases and Enhance Data Quality for Protein-Based Postmortem Interval (PMI) Delimitation

Anja Victoria Perner, BSc, Eugendorf, Salzburg 5301, AUSTRIA; Bianca Ehrenfellner, MS, University of Salzburg, Salzburg 5020, AUSTRIA; Janine Geissenberger, MSc, Department of Biosciences, University of Salzburg, Salzburg 5020, AUSTRIA; Fabio Carlo Monticelli, Interfacultary Department Forensic Pathology, Salzburg 5020, AUSTRIA; Peter Steinbacher, PhD, University of Salzburg, Salzburg, AUSTRIA; Stefan Pittner, PhD, University of Salzburg, Salzburg, AUSTRIA*

Learning Overview: After attending this presentation, attendees will have gained knowledge about influencing factors on muscle protein degradation, as well as on solutions to method-specific challenges, that facilitate the improvement of data acquisition and quality.

Impact on the Forensic Science Community: The estimation of the time since death has always been a major topic in forensic science. The future goal is to develop a practical and easily feasible method for PMI delimitation, based on molecular markers that can be used in the early and late postmortem period. This presentation will impact the forensic science community by informing attendees that further research on how internal and external conditions influence the process is needed to be able to make reliable judgements based on the method in forensic case work.

Background: Delimiting the PMI is a central question in routine forensic work and often still one of the most difficult challenges. The biochemical analysis of the postmortem disintegration of proteins in human muscle tissue has recently shown to be a valuable approach for this task. However, case-specific circumstances of death, and the influence of individual variables, as well as environmental conditions on protein degradation, such as Body Mass Index (BMI), age, or exposure of a body in each case, are yet to be thoroughly investigated to produce reliable results and thus allow successful application of this method to routine forensic work.

Methods: Samples of human muscle tissue were taken every 4–6 hours over a period of at least 24h, in ten autopsy cases, and analyzed for skeletal muscle protein degradation. The bodies were stored in a climate chamber, with controlled environmental temperature and humidity, and sampled up to nine times per case. Cases with well-known PMIs and reliable information in terms of ambient temperature were selected for this pilot project to maximize the validity of the results and allow comparisons between cases. Causes of death were diverse, initial PMIs ranged from 28 to 126 hours postmortem (hpm) and storage temperatures during the sampling period were individually chosen between 5°C to 15°C.

Results: By analyzing multiple samplings of human muscle tissue at different postmortem time points under controlled environmental conditions, possible biases arising from varying age, BMI, sex, and metabolic rate between individuals were eliminated and by that obtained unique outcomes. Additionally, critical challenges to overcome for future data acquisition and analysis were identified.

Conclusion: This study highlights the benefits of multiple tissue samplings of individuals over a period of time. In comparison to samples from single time points, this approach provides reliable, largely unbiased data on postmortem muscle protein degradation. Future research should aim to gain further knowledge about the impact of influencing factors on the process of postmortem protein degradation in human skeletal muscle tissue for this method to be confidently used in routine forensic PMI determination.

PMI Delimitation, Protein Degradation, Multiple Sampling

*Presenting Author