



E83 Discovery Index Metabolites for the Estimation Age of Bloodstain

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Learning Overview: After attending this presentation, attendees will understand that bloodstain metabolites can be used to reliably index material for an estimation of a bloodstain age. Attendees will also learn that the age of a bloodstain can be distinguished weekly using candidate metabolites.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by suggesting candidate metabolites for estimating bloodstain age. This study is the first report to identify index materials used to analyze the age of bloodstains through metabolomics analysis.

In this study, index material for determining the age of bloodstains was discovered by analyzing changed patterns of bloodstain metabolites using High-Performance Liquid Chromatography/Tandem Mass Spectrometry (HPLC/MS/MS). Bloodstains were prepared on filter paper and confirmed at weekly intervals until day 21. Using Venn diagrams and multivariate analysis, 62 candidate molecular features were selected.

Partial Least Squares Discriminant Analysis (PLSDA) was used to confirm that the group could be classified with an accuracy of 75.0%, and R2 and Q2 were 0.7513 and 0.6998, respectively. Among the 62 candidates, five metabolites were successfully identified. Metabolite A decreased as time passed. In the cases of metabolite B, metabolite C, and metabolite D, they increased at day 7 after day 0, and gradually decreased after day 7. In the simple regression analysis, all five candidates were statistically significant at day 21 versus day 0, and metabolite B and metabolite C at day 21 versus day 7 were also significant. The *p*-value of metabolite A was significant in all date combinations, so it is possible to distinguish time by week. Metabolite B and metabolite C were also statistically significant in all combinations, except day 14 versus day 7. Metabolite D showed significant results in all combinations, except day 7 compared to day 0, and metabolite D was significant at day 0 versus day 21, day 7 versus day 21, and day 14 versus day 21. Therefore, it is possible to measure the age of the bloodstain according to the distinguishing characteristics of candidate by date.

These novel metabolic approaches will help in the estimation of the age of bloodstains in forensic analysis. Currently, the time of the incident is specified through the estimated time of death by autopsy and forensic entomology. However, a metabolic approach can be used as the main basis for screening suspects by estimating the time of occurrence of the crime through the measurement of the age of bloodstains using the metabolites.

Bloodstain, Bloodstain Age, Metabolomics