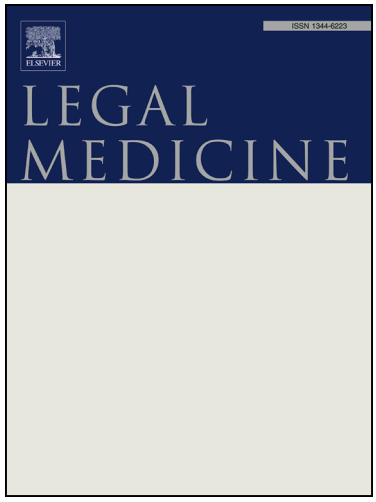

Estimation of early postmortem interval in rats by GC-MS-based metabolomics

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Estimation of early postmortem interval in rats by GC-MS-based metabolomics

Abstract

Accurately predicting the early postmortem interval (PMI) is of great significance in forensic practice. This study aimed to establish a novel method for estimating the early PMI by analyzing endogenous substances in the cardiac blood of male and female rats and compare different model for estimating early PMI using these data. Adult Sprague-Dawley (SD) rats (50% male) were sacrificed by suffocation. Then, cardiac blood was collected at various time intervals (0, 3, 6, 12, 24, 48, and 72 h) after death, and the collected samples were analyzed by gas chromatography-tandem mass spectrometry (GC-MS). The data were analyzed by multivariate statistical analysis. An orthogonal signal correction-partial least squares (OSC-PLS) regression model was constructed with whole endogenous metabolites to validate the PMI. The OSC-PLS regression model successfully predicted the PMI of the forecast set and no significant differences was observed between male and female rats. This is the first study to establish an OSC-PLS regression model for predicting PMI with the metabolome, which provides a new technical method and platform for estimating PMI through metabolomics.

Keywords: postmortem interval; metabolomics; metabolome; GC-MS

1 Introduction

Postmortem interval (PMI), an important index in forensics, plays a central role in determining the time point at which an incident occurred, determining whether a suspect had the time to commit a crime, and delimiting the scope of an investigation. Currently, several methods are used to estimate PMI. Early postmortem phenomena, such as, corpse[1], rigor mortis [2], livor mortis [3], and corneal opacity [4]can be used to estimate PMI; however, these studies rely on strong empirical and subjective. Thus, researchers have developed other ways to infer PMI, such as measurement of various physical changes [2], biochemical components in different tissues and body fluids [5], and DNA or RNA degradation [6] as well as forensic entomology [7]. In a previous study, we measured the concentrations of AMP, ADP, and ATP in the gastrocnemius of rats at different times points after death, and the results showed that